PARIS

CHALLENGES, OPPORTUNITIES AND NEW PERSPECTIVES IN ENDODONTOLOGY

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Oral Presentations On Freely Chosen Subjects

ORAL PRESENTATIONS ON FREELY CHOSEN SUBJECTS

OP001 | A CLINICAL GUIDE FOR THE MANAGEMENT OF PULP CANAL CALCIFICATION

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Aim: To provide a conservative, Step-by-Step approach in the clinical management of pulp canal calcification

Methodology: The root canal space can be moderately or severely obliterated due to many factors. The clinical management of calcified pulp chambers and canals remains one of the most challenging aspects of endodontic practice. This presentation will focus on effective, non-invasive strategies for managing calcified teeth, emphasizing a step-by-step approach that preserves tooth structure while achieving optimal treatment outcomes. Key diagnostic tools, including cone-beam computed tomography (CBCT) and digital radiography, will be highlighted for their ability to assess the degree of calcification and guide decision-making. The presentation will cover practical techniques for accessing calcified pulp chambers using the operating microscope or the guided endodontic technique, and creating a stable glide path, with a focus on using flexible nickel-titanium (NiTi) rotary instruments, ultrasonic tips, and gentle irrigation protocols to navigate and clean calcified canals. The importance of achieving apical patency, proper shaping, and effective obturation in these challenging cases will also be discussed. By the end of the session, attendees will have a comprehensive understanding of the non-surgical techniques required to manage calcified pulp chambers and canals, leading to improved clinical outcomes and enhanced patient care.

Results:
- To make a proper a diagnosis using advanced diagnostic tools like CBCT to assess the degree of calcification and the canal precise location, shape and morphology.
- To carefully design the access cavity to minimize the removal of sound tooth structure while ensuring optimal visibility.
- Use of ultrasonic tips and fine tip burs to gently remove the calcified material
- Choose between conventional approach and guided endodontics

OP002 | EFFECT OF ACCESS CAVITY DESIGNS ON ROOT CANAL SHAPING EFFICIENCY AND TOOTH FRACTURE RESISTANCE

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Aim: To discuss traditional, conservative, and ultraconservative access cavity designs in endodontics.

Methodology: The design of endodontic access cavities plays a crucial role in both the efficiency of root canal shaping and the subsequent fracture resistance of the treated tooth. Traditional, conservative, and ninja cavity designs each have unique effects on these two critical aspects of root canal therapy. Traditional cavity designs, which involve more extensive removal of tooth structure, provide straightforward access to the root canals, facilitating efficient cleaning and shaping. However, the significant loss of tooth structure associated with these designs can lead to reduced fracture resistance, increasing the risk of tooth fracture post-treatment. Conservative cavity designs aim to minimize tooth structure removal while still providing adequate access to the pulp chamber and root canals. This approach typically results in improved fracture resistance compared to traditional designs, although it may sometimes compromise shaping efficiency, especially in complex canal systems. The ninja cavity design represents an ultraconservative approach that maximizes tooth preservation by minimizing access cavity size and preserving more of the surrounding tooth structure. While this design enhances fracture resistance to the greatest extent, it can challenge the shaping efficiency, as the restricted access may hinder the thorough cleaning and shaping of the root canal system. Ultimately, the choice of cavity design must balance the need for effective canal preparation with the goal of maintaining long-term tooth integrity, with each design offering a distinct trade-off between shaping efficiency and fracture resistance.

Results: Due to the advantages and disadvantages of endodontic access cavity principles in comparison to each other, the choice of access cavity design should be made based on the specific case.

OP003 | INFLUENCE OF SOFFIT PRESERVATION ON STRESS DISTRIBUTION: A FINITE ELEMENT STUDY

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Aim: This study aimed to assess the impact of the soffit on stress distribution in a mandibular molar using finite element analysis (FEA)

Methodology: A two-rooted mandibular molar was scanned in a micro-CT device with a 19 µm pixel size. A contracted access cavity was prepared, partially preserving the soffit, followed by a second scan. After removing the soffit, a third scan was performed. Co-registered datasets were used to create 3D models of enamel, dentin, the root canal system, periodontal ligament, and lamina dura. These models were integrated into a parametric mandibular bone block and subjected to FEA. Static loads simulating normal (250 N), maximum (600 N and 800 N), and lateral (225 N) mastication forces were applied to both intact and prepared models, with the access cavity restored with composite resin. Stress distribution and von Mises stresses were analyzed across four root levels: pericervical area, furcation region, and middle and apical thirds. Results showed that access cavity preparation affected stress distribution. The highest von Mises stresses occurred at the pericervical and furcation levels. Lateral loads produced lower stress than vertical loads. Despite variations in stress magnitudes, the overall distribution remained consistent across both models after access cavity preparation. Under higher vertical loads, peak stresses occurred on the distal aspect of the distal root (pericervical level) and the distal aspect of the mesial root (middle third). It was concluded that soffit preservation did not affect the overall biomechanical behavior of the mandibular molar.

Results:
1. FEA was used to simulate stress distribution in mandibular molars after access cavity preparation.
2. The study found that while access cavity preparation influenced stress distribution, soffit preservation did not significantly impact the overall biomechanical behavior of the tooth.
3. These findings suggest that preserving pericervical dentin is more critical for fracture resistance than soffit preservation alone.

OP004 | UNVEIL THE HIDDEN PATH: READING THE DENTINAL MAP TO LOCATE SEVERELY CALCIFIED CANALS

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Aim: To leverage the understanding of pulp chamber anatomy and interpret the dentinal map for safe and consistent identification of canal orifices in severely calcified teeth.

Methodology: Locating canal orifices in severely calcified cases poses significant challenges, often requiring a thorough understanding of the alterations in pulp chamber floor morphology as a result of calcification. This presentation delves into the progressive changes caused by severe sclerosis, which manifest as distinct patterns, color variations, and light-reflection properties on the dentinal map in the floor of the pulp chamber. These clues serve as vital guides for practitioners attempting to locate canal orifices amidst dense calcifications.
The talk will also explore advanced techniques and tools designed to enhance visibility and access to these hidden orifices. By combining theoretical knowledge with practical insights, attendees will gain strategies to navigate calcification-induced complexities effectively. Emphasis will be placed on precision, safety, and minimizing structural damage during canal localization.

Results:
• Understanding the anatomical landmarks of the pulp chamber and how they can change due to calcification.
• Identifying and interpreting color, texture, and light-reflection patterns on the dentinal map to pinpoint calcified canal orifices.
• Utilizing minimally invasive techniques and specialized tools (e.g., ultrasonic tips, microscopes) to unveil and access closed orifices effectively.
• Enhancing diagnostic acumen through recognition of subtle clinical cues while ensuring procedural safety.
• Improving treatment outcomes by integrating knowledge-based strategies into clinical practice.

OP005 | INNOVATIVE APPROACH FOR ENDODONTIC DISINFECTION USING COPPER-RICH SMA FILES AND FENTON REACTION

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Aim: This presentation will highlight the potential of a newly developed endodontic file made from Copper-Aluminium-Nickel (CuAlNi) shape memory alloy (SMA), emphasizing its intrinsic antibacterial properties and exploring its promising applications in endodontic treatments.

Methodology: Secondary endodontic infections represent a significant and growing public health concern. They are caused by remanent microorganisms in the root canal and specially Enterococcus faecalis, even after standard preparation/disinfection procedures involving Nickel-Titanium files and sodium hypochlorite. To enhance root canal disinfection through the synergy between instruments and an antimicrobial solution, single-crystal copper-rich SMA wires were used in combination with hydrogen peroxide-containing solution. This interaction triggered a Fenton-like reaction, leading to the generation of reactive oxygen species with potent bactericidal effects.

The antimicrobial efficacy of this strategy was assessed on planktonic E. faecalis strain through CFU-counts and on mature biofilm of this same strain grown on hydroxyapatite disks, a substrate mimicking the dentin composition, using LIVE/DEAD BacLight and confocal microscopy analysis. The results demonstrated a remarkable reduction in bacterial viability in both conditions, emphasizing the enhanced antimicrobial potential of copper-rich SMA wires combined with H2O2. This synergy presents a promising and time-saving alternative to conventional protocols by allowing simultaneous irrigation, disinfection, and root canal preparation, offering an effective strategy against persistent pathogens often resistant to standard treatments.

Results:
- Copper-rich SMA wires combined with H2O2 enhance disinfection through a Fenton-like reaction.
- Saves time by allowing simultaneous irrigation, disinfection, and root canal preparation.
- Effective against E. faecalis, a key pathogen in secondary endodontic infections.

OP006 | NEW AVENUES OPEN FOR THE USE OF BACTERIOPHAGES IN ENDODONTIC TREATMENT

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Aim: This lecture aims to provide information about bacteriophages and their potential use in Endodontology.

Methodology: Bacteriophages—also known as phages—are viruses that infect and kill bacteria, where they reproduce. Their capsid, or protein shell, where the genetic content (DNA) of the virus is located, may vary in shape. The infective nature of several diseases—caries, periodontal diseases, periapical diseases, inflammatory disorders of the oral mucosa and infections due to implant procedures—suggests that specific bacteriophages may be used as aids to target bacteria in Dentistry. Bacteriophages may destroy biofilm or limit its growth or maturation, which might reduce the impact of infections or control their acute phases. The current knowledge in the Endodontic field is limited to Enterococcus faecalis phages. This makes sense, as the use of bacteriophages should target bacteria that pose a challenge to the clinician. Our research group is also involved in the development of Staphylococcus epidermidis phages, as these bacteria are associated with acute phase of endodontic infection. By using their phages, there could be a reduction in the acute phase and early recruitment of imune system cells. Another approach o four research team is the encapsulation of phages for their slow release within the root canal system and dentinal tubules system. The use of bacteriophages in Endodontic treatment should be in specific situations, aiming at the best possible treatment outcome.

Results:
- Bacteriophages destroy specific bacteria
- Enterococcus faecalis phages may help against persistente infections
- Staphylococcus epidermidis phages are of interest as may fight acute cases
- Encapsulation of phages may help slow delivery and with longer effect on root canal system

OP008 | MULTI-CENTER PRG VISUAL DIAGNOSIS FROM CBCT IMAGES VIA A UNIFIED DL FRAMEWORK

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Aim: To develop an automated deep learning framework for three-dimensional visualization, diagnosis, and classification of palatal radicular groove (PRG) lesions using cone-beam computed tomography (CBCT) imaging.

Methodology: Palatal radicular groove (PRG) presents a significant diagnostic and therapeutic challenge in endodontics due to its intricate anatomy and association with periodontal and endodontic complications. Early diagnosis and precise classification are critical for improving patient outcomes. However, interpreting and visualizing data from diagnostic tools, particularly cone-beam computed tomography (CBCT), presents significant challenges. To address these challenges, this multicenter study introduces PRG-Net, a novel unified framework integrating tooth segmentation, PRG detection, and morphological classification (Types I-III) through deep learning architecture. Utilizing CBCT datasets from four clinical centers (1 internal, 3 external), the system achieved exceptional performance metrics: 97.06% average Dice Similarity Coefficient for tooth segmentation (95% CI:0.85-0.88), diagnostic AUC of 0.94 (internal) and 0.85-0.90 (external), with classification F1-scores of 0.89/0.87/0.96 for Type I/II/III lesions respectively. The system enables 3D visualization of PRG spatial relationships while maintaining diagnostic consistency across institutions. PRG-Net offers a comprehensive and automated approach to PRG evaluation, enhancing clinical decision-making. Its high accuracy and generalizability position it as a transformative tool for PRG management.

Results:

1. First AI system providing simultaneous 3D visualization and automated classification of PRG morphology

2. Achieved exceptional accuracy in lesion classification (F1-score >0.87 for all PRG types)

3. Demonstrated generalizability through multicenter validation with consistent diagnostic performance (AUC >0.85 across all external sites)

OP010 | EVIDENCE-BASED POTENTIAL OF ARTIFICIAL INTELLIGENCE LANGUAGE MODELS ON DENTAL ANTIBIOTIC USAGE

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Aim: In this study, the accuracy and comprehensiveness of the answers given to questions about dental antibiotic usage by two artificial intelligence-based language models, ChatGPT and Gemini, were comparatively evaluated.

Methodology: Within the scope of our study, total of 36 questions were prepared, including multiple-choice questions, binary questions, and open-ended questions as technical questions and patient questions about dental antibiotic usage. They were directed to ChatGPT and Gemini. Responses were recorded and scored by four endodontists. Statistical analyses, including ICC analysis, were performed to determine the agreement and accuracy of the responses. The significance level was set as $p<0.05$. The responses given by the Gemini program to open-ended questions have been found to be more comprehensive, explanatory, and understandable. The mean score of the Gemini model was statistically significantly higher than the ChatGPT.

Results: The Gemini and ChatGPT language models for dental antibiotic usage undoubtedly show promise. To guarantee the successful incorporation of LLMs into dental practice, it is imperative to conduct additional research, clinical validation, and improvements to the models.

OP011 | ARTIFICIAL INTELLIGENCE IN ENDODONTICS: CLINICAL APPLICATIONS, LIMITATIONS, AND FUTURE DIRECTIONS

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Aim: This presentation is focusing on the advancements made by the use of artificial intelligence in dentistry with its current limitations as well as the ethical dilemmas posed by its rapid expansion.

Methodology: Artificial Intelligence (AI) is making significant improvements in healthcare, particularly in the field of endodontics.As its primary benefit is the improvement of interactions between humans and machines .AI models have proven their worth in the domains of root canal anatomy, detection of periapical lesions in early stages as well as providing accurate working-length determination.Moreover tools like Artificial Neural Networks (ANN) ,Machine Learning and Convolutional Neural Networks (CNN) are essential in making complex decisions on diagnostic accuracy,treatment success and pain management. This technology also has the potential to reshape endodontic education through virtual simulations generating highly detailed 3D models, allowing endodontists to better understand root canal morphology and automated evaluation of skills .Furthermore robotic process automation can perform administrative procedures and alleviate physician burnouts.On the other hand inspite the range of its contributions and the scope of its futre uses considerations arise regarding ethical concers around patient privacy, data security, and algorithmic bias.Nonetheless the integration into clinical workflow and the continuous learning and updates needed by its systems also provide limitations to its broader use.The future however seems bright with regarards to endanced diagnostic accuracy,personalized treatment plans,education and training as well as collaborative AI systems.

Results:
1)Vast scope of AI clinical aplications(tooth morphology,imaging precision,treatment planning and prognosis etc)
2)Improvements in human-machine interactions
3)Optimization of clinical workflow and quality of life for practitians and patients alike
4)Challenges include:data protection,liability and regulation
5)Ethical conciderations,limited data
6)Rapid expansion in robotics.AI powered microscopes and machine learning

OP012 | THE USE OF AI AND DIGITAL WORKFLOW IN SURGICAL ENDODONTICS. THINK OUTSIDE THE BOX!

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Aim: To explore the transformative impact of artificial intelligence (AI) and digital workflow in surgical endodontics, focusing on their role in enhancing diagnosis, treatment planning, and procedural accuracy in root-end microsurgery, intentional replantation, and autotransplantation.

Methodology: Prevention and/or elimination of pulpal pathology and apical periodontitis is the ultimate goal of endodontic treatment. The success rate of primary non-surgical root canal treatment is >90%.
Root canal retreatment might also fail or may not be feasible, on those cases root end surgery is the procedure of choice in those cases. The success rate of the micro-surgery was reported to be (94%) as shown in the systematic review and meta-analysis by Setzer et al. Despite its very high success, micro-surgery may be difficult to perform in certain cases.
The combination of artificial intelligence (AI) and digital workflow has the potential to revolutionize endodontics. AI can be used to improve diagnosis, treatment planning, and patient care, while digital workflow can improve efficiency and accuracy
In this lecture, the advancement of AI and digital workflow in the field of Endodontic microsurgery, intentional replantation, and autotransplantation will be discussed, including the use of guided and navigation systems technology to perform the highest standard procedure with a predictable outcome.

Results: At conclusion, participants should be able to:
1- Learn how to use artificial intelligence (AI) to improve the diagnosis and treatment planning.
2- Perform precise and accurate guided Root-end surgeries.
3- Discuss the use of digital workflows in Endodontics to maximize the outcome of Auto transplantation for different clinical presentations.

OP014 | DIAGNOSTIC ACCURACY OF COLD, HEAT, AND ELECTRICAL PULP TESTS: AN IN VIVO STUDY

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Aim: This in vivo study aimed to evaluate and compare the sensitivity, specificity, predictive values, and overall accuracy of cold, heat, and electrical pulp tests (EPT) in determining pulp vitality.

Methodology: This study was approved by the Ethics Committee of Istanbul University (protocol no. 2024/48 Rev-2), and written informed consent was obtained from all participants. A total of 175 patients were included, with one tooth selected per patient. Among these teeth, 113 had vital pulp, while 62 had necrotic pulp, resulting in a disease prevalence of 35.42%.
Pulp sensibility was assessed using the cold test (Endo-Frost; Roeko, Coltene Whaledent, Germany), the heat test (rubber cup), and EPT (Ai-Pex; Woodpecker, China). The definitive pulp status was confirmed by direct visualization of bleeding upon access cavity preparation.
The kappa agreement coefficients for cold, heat, and EPT compared to the gold standard were 0.91, 0.75, and 0.82, respectively. Sensitivity values were 0.952 (cold), 0.935 (heat), and 0.903 (EPT), while specificity values were 0.965, 0.85, and 0.929, respectively. Positive predictive values were 0.937 (cold), 0.773 (heat), and 0.875 (EPT), whereas negative predictive values were 0.973, 0.96, and 0.946, respectively. The overall accuracy of the tests was 0.96 for the cold test, 0.88 for the heat test, and 0.92 for EPT.
Statistical analysis revealed a significant difference in response among the tests ($p = 0.006$). Among the evaluated pulp sensibility tests, the cold test exhibited the highest accuracy, followed by EPT and then the heat test. These findings highlight the diagnostic value of cold testing as a reliable method for assessing pulp vitality in clinical practice.

Results: The findings suggest that among the three tested methods, the cold test provides the most accurate results for assessing pulp vitality.

OP015 | INVESTIGATION OF ROTARY INSTRUMENT SYSTEM PREFERENCES IN ENDODONTIC RETREATMENT IN TURKEY

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Aim: The aim of this study is to identify practitioners' habits regarding nonsurgical root canal retreatment, analyze their preferences for rotary instrument systems, assess their level of knowledge, explore their perspectives, and evaluate these aspects based on scientific criteria.

Methodology: A 10-item survey was conducted online among general dentists, endodontists, and other specialist dentists. The survey consists of two sections: the first section includes demographic information such as gender and area of specialization, while the second section contains questions designed to assess dentists' usage of nickel-titanium rotary files. A total of 565 participants took part in the survey, with the majority consisting of general dentists and endodontists (89.2%). All statistical analyses were performed using IBM SPSS 25 software. A significant relationship was found between the file used after access cavity preparation and gender ($p = 0.007$). In the preference for rotary instrument systems used during retreatment, general practitioners were observed to use rotary systems more frequently, whereas endodontists predominantly preferred retreatment files (D1, D2, D3) ($p = 0.021$).

Results: This study reveals dentists' habits regarding retreatment and their preferences for rotary instrument systems.
-It was determined that gender and area of specialization have an impact on these preferences; female practitioners tend to prefer traditional files more, while endodontists predominantly use retreatment files.
-The most significant disadvantage of rotary instrument systems was identified as instrument fracture, while the primary expectation was the preservation of the anatomical form of the root canal.
-These findings emphasize the importance of continuous education and professional development for optimizing instrument selection and improving endodontic retreatment outcomes.
Keyword: Endodontic Retreatment, Nickel-Titanium (Ni-Ti), Rotary instrument systems, treatment approach.

OP017 | EFFECT OF BIOACTIVE GLASS BIOMATERIALS ON THE DENTIN SURFACE AND ON THE DENTIN INTERFACE WITH ENDODONTIC SEALERS

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Aim: Biomaterials can be used to improve the interface between dentin and endodontic sealers. Laboratory of Vitreous Materials (UFSCar, SP, Brazil) has developed a bioglass, called F18 (BGF18), with high bioactivity, and Biosilicate (BIS), specific composition of glass-ceramics. This study evaluated the effect of dentin treatment with BGF18 and BIS on the dentin surface and and on the bond strength with endodontic sealers.

Methodology: Root canals of human teeth were prepared for dentin surface analysis according to dentin treatments by BGF18 or BSI, and immersion in phosphate buffered saline. Specimens were analyzed by scanning electron microscopy for calcium apatite precipitation. Bovine teeth were used to prepare discs for bond strength (BS) evaluation after protocols using different concentrations of BGF18 and BSI. The specimens were filled with different sealers: AH Plus (AHP, Dentsply, Switzerland), Bio-C Sealer (BCS, ready-to-use endodontic bioceramic, Angelus, Brazil) or BioRoot RCS (BR, Septodont, France). Circular dentin discs were prepared from bovine roots for tensile testing after different treatments and contact with endodontic sealers. Mechanical push-out and tensile tests were performed using a mechanical testing machine (EMIC DL 2000) with a load of 50 kN and speed of 0.5 mm/min. Data were subjected to normality test, ANOVA and Tukey tests ($p<0.05$). SEM revealed that treatment with BGF18 and BSI demonstrated regular and uniform calcium apatite precipitation showing bioactive potential in dentin. The push-out and tensile tests demonstrated that treatment with BGF18 and BSI promoted greater bond strength ($p<0.05$) between dentin and endodontic sealers.

Results: Bioactive glass biomaterials can promote the deposition of bioactive material on the dentin surface, and improve the interface between dentin and endodontic sealers.
Dentin treatment with bioactive glass can significantly increase the bond strength between dentin and bioceramic or resin endodontic sealers.

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OP018 | EVALUATION OF THE BIOCOMPATIBILITY OF BIO-C TEMP, CALCIUM HYDROXIDE, AND CHLORHEXIDINE GEL ON SAOS-2 AND NHDF CELL LINES

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Aim: Aim to evaluate the cytotoxic effects of three widely used intracanal medicaments—Bio-C Temp, calcium hydroxide, and chlorhexidine gel—on SaOS-2 (human osteosarcoma) and NHDF (normal human dermal fibroblast) cell lines. The findings provide insights into their biocompatibility and suitability for clinical use.

Methodology: Cytotoxicity was assessed following ISO 10993-5:2009 guidelines. SaOS-2 and NHDF cells were cultured in DMEM with fetal bovine serum, gentamicin, and sodium pyruvate. The test materials were prepared at different concentrations (1×, 2×, 4×, and 8×) and applied via the extraction method. Cell viability was determined using the MTT assay, measuring absorbance at 570 nm. Statistical analysis was performed using one-way ANOVA, followed by Tukey post-hoc tests ($p < 0.05$ was considered significant).
The results showed that chlorhexidine gel exhibited the highest cytotoxicity, significantly reducing cell viability below 70% in both cell lines ($p < 0.001$). Calcium hydroxide displayed moderate cytotoxicity, particularly at higher concentrations ($p < 0.05$). In contrast, Bio-C Temp demonstrated the lowest cytotoxic effect ($p < 0.001$), indicating superior biocompatibility among the tested medicaments. Dilution levels did not significantly affect cytotoxicity ($p > 0.05$), suggesting that the cytotoxic effects were primarily dependent on the medicament type rather than its concentration.

Results:
- Bio-C Temp is the most biocompatible option ($p < 0.001$), supporting its potential use in endodontic regeneration and clinical practice.
- Calcium hydroxide had moderate cytotoxicity ($p < 0.05$), suggesting its suitability in controlled applications for its antimicrobial properties.
- Chlorhexidine gel showed significant cytotoxicity ($p < 0.001$), limiting its application in biocompatibility-dependent endodontic treatments.

OP019 | CHARACTERIZATION OF DIFFERENT CEMENTS USED IN ENDODONTIC SEALERS

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Aim: The aim of the study is to characterize microstructure; chemical and biological properties of cements used in endodontic sealers.

Methodology: Introduction: Hydraulic calcium silicate sealers known as BioCeramics may have different chemistry. The specific chemistry will affect the interaction of these materials with human tissues.

Materials and Method: Three groups of cements used in endodontic sealers: high alumina cement (HAC), Portland cement (PC), 50:50 HAC and PC were investigated and compared with Biodentine and NeoSEALER Flo. Biodentine is composed of tricalcium silicate while NeoSEALER is composed of HAC. Energy Dispersive Spectroscopic (EDS) qualitative analysis was conducted for various selected areas. Microstructure changes of tested materials were assessed after immersion in de ionized water and PBS for 7-, 28- and 90-days using scanning electron microscopy (SEM) and X-ray diffraction (XRD) analysis. The leachate was investigated using inductive coupled plasma (ICP) to detect ion release for 7, 28 and 90 days. CCK-8 was performed to evaluate the effect of the materials on the number of viable cells.

Results: XRD micrograph showed that calcium hydroxide formation varied between materials with distinct CaOH peak for Biodentine and PC. Leaching profile showed a similar picture and this affected the material interaction with the biological tissue.

Conclusion: The chemistry of cement affects biological behavior at cellular level.
Key words: Hydraulic calcium, silicate cement, Portland cement, endodontic endodontics sealers/ Biodentine

OP020 | EFFECT OF DIFFERENT ACTIVATION DEVICES ON LATERAL CANALS FILLING WITH BIOCERAMIC SEALER: A MICRO-CT STUDY

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Aim: To evaluate the distribution of bioceramic root canal sealer within standardized lateral root canals of 3D artificial teeth using different activation devices through micro-CT analysis.

Methodology: This in vitro study assessed how different activation devices affect bioceramic root canal sealer distribution in standardized lateral canals of 3D artificial teeth. Twenty resin-based artificial central teeth with straight root canals were used. The 3D models were designed using Cura Slicing software (Ultimaker, Netherlands) and fabricated via stereolithography printing, with 0.3 mm diameter lateral canals at 3 mm and 10 mm from the root apex.

Samples were divided into four groups (n=5). The first group used the DTE S6 device with an ED60 ultrasonic tip, the second used the Yoshi 812 MT device with a 35.04 file, and the third applied the UltraX device, each activated for 20 seconds. The fourth group served as a control without activation. After sealer placement, all teeth underwent single-cone obturation with a 35.04 angled gutta-percha cone. Micro-computed tomography (micro-CT) provided detailed imaging of sealer distribution. Analysis was conducted using NRecon software, and a t-test evaluated data homogeneity and sealer volume in the lateral canals.

Ultrasonic devices (DTE S6, UltraX) showed significantly better lateral canal filling than the sonic device (Yoshi 812 MT) and the control group. Ultrasonic activation provided the highest sealer distribution efficiency. These results indicate that ultrasonic activation enhances lateral canal filling, contributing to improved treatment outcomes and long-term success in root canal therapies.

Results: The study demonstrated that ultrasonic (DTE S6, UltraX) activation methods outperformed sonic (Yoshi 812 MT) and control groups in bioceramic sealer distribution. The use of advanced 3D models and micro-CT technology enabled precise visualization of sealer distribution, highlighting the clinical advantage of ultrasonic activation in enhancing endodontic treatment success.

OP021 | CLINICAL USE OF HYDRAULIC CALCIUM SILICATE CEMENTS IN COMPLEX ENDODONTIC CASES

S. HERANIN

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Aim: The aim of this presentation is to review the clinical use and behavior of hydraulic calcium silicate cements (MTA / Bioceramics) in different clinical cases: perforating internal root resorption, root perforations, open apices with long-term treatment outcomes.

Methodology: Hydraulic calcium silicate cements have been successfully used for over 20 years in endodontic therapy for sealing the communication between the root canal system and periodontium. Mineral trioxide aggregate (MTA) is still widely used material due to its antibacterial properties, biocompatibility and excellent sealing ability. However, this material has some drawbacks such as potential tooth discoloration, long setting time and difficult handling. Recently, tricalcium silicate cement materials have been developed, maintaining the original components of Mineral trioxide aggregate (MTA) and used for the same purpose: vital pulp therapy, root perforation repair, perforating root resorption and as an apical plug. The capacity to promote mineralization have a huge contribution to the clinical success of using MTA-based and tricalcium silicate cements. Operator should provide thorough cleaning and obturation of the whole root canal space. Sodium hypochlorite and calcium hydroxide used during endodontic treatment are very important to disinfect the root canal system. Conventional periapical radiographs are the primary method used in endodontic diagnosis. However, additional Cone-Beam Computed Tomography (CBCT) investigation has a powerful value in clarifying the diagnosis and long-term follow-ups when compared to periapical radiographs.

Results: Mineral trioxide aggregate (MTA) and Bioceramics are material of choice in cases of root perforation and open apex.
Tricalcium silicate cements have some benefits in comparison to classic Mineral trioxide aggregate (MTA) formula.
Long-term follow-ups with the use of Cone-Beam Computer Tomography are of the great importance.

OP023 | A COMPARATIVE PUSH-OUT BOND STRENGTH ANALYSIS OF BIOACTIVE GLASS AND RESIN-BASED ROOT CANAL SEALERS

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Aim: This study aims to evaluate the bonding efficacy of a novel bioactive glass root canal sealer (Nishika BG) in comparison to the commonly used resin-based sealer (AH Plus), using the push-out bond strength test.

Methodology: A total of 40 extracted single-root premolars were divided into two groups, each treated with one of the sealers. After root canal preparation using the Protaper NEXT system, the Downpack-Backfill technique was applied for obturation. The specimens were sectioned at three levels—coronal, middle, and apical—and subjected to push-out bond strength testing using an Instron testing machine. The bond strength results were measured in megapascals (MPa), and failure patterns (cohesive, adhesive, or mixed) were evaluated under a light stereomicroscope.
The results showed Nishika BG sealer had superior bond strength compared to AH Plus at coronal and middle levels, with no significant difference at the apical level. AH Plus sealer's highest bond strength was at the apical level (2.69 ± 0.25 MPa), while Nishika BG sealer achieved its highest at the apical level (3.94 ± 0.24 MPa). Statistical analysis was performed using One-way ANOVA to evaluate differences in mean push-out bond strength between the two sealers, with Post-Hoc Tukey's test applied to examine pairwise differences within each sealer group. The Nishika BG sealer showed significant differences in bond strength across all root canal levels, while AH Plus demonstrated significant variation only at the apical level. Both sealers predominantly exhibited mixed failure, but AH Plus showed no instances of cohesive failure, whereas Nishika BG had some cohesive failures (18.33%).

Results: The Nishika bioactive glass sealer demonstrated superior bond strength compared to the AH Plus resin-based sealer, particularly at the coronal and middle levels of the root canal, offering promising potential for improving root canal sealing efficiency.

OP024 | BIO-OBTURATION: A PARADIGM SHIFT IN ROOT CANAL TREATMENT BY ENDODONTIC BIOMATERIALS

A. ESLAMBOL NASSAJ

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Aim: Bio-obturation with endodontic biomaterials should be considered a viable treatment option for the obturation of cases with internal and external resorption, root perforations, canal obstructions, and trauma-related injuries, conditions where traditional methods and materials are often ineffective.

Methodology: Bio-obturation is an innovative approach in root canal therapy that effectively addresses complex clinical challenges using biocompatible endodontic materials to optimize root canal filling, enhance sealing properties, and promote the healing/regeneration of surrounding tissues. Bio-obturation materials, such as mineral trioxide aggregate (MTA) and calcium-enriched mixture cement (CEM), have demonstrated superior sealing abilities and exceptional biocompatibility, making them particularly effective for managing resorptive lesions. This case series highlights cases where bioactive materials were employed to manage and obturate the complications such as internal and external resorption, root perforations, draining sinus, large periapical lesions, mechanical obstructions, and trauma related injuries. It highlights the role of this obturation technique in the endodontic practice, where achieving healing and repair along with long-term favorable results in both immature and mature teeth are the primary goal. Through these case reports, a comprehensive overview is provided of its clinical applications, benefits, and its ability to address the limitations of traditional techniques.

Results: Bio-obturation with bioactive materials (e.g., CEM cement) improves root canal therapy through enhanced biological sealing and periradicular healing. This biologically driven approach offers a reliable alternative to conventional methods, ensuring long-term clinical success.

OP025 | ADDRESSING THE APEX DILEMMA: CLINICAL AND BIOLOGICAL PERSPECTIVES ON EXTRUDED ENDODONTIC MATERIALS

A. CHHABRA

Aiims Kalyani, Kalyani, India

Aim: This study focuses on assessing bone tissue reactions to six commonly used endodontic materials, providing valuable insights into their behavior when extruded beyond the root apex.

Methodology:
Background: Unintentional extrusion of endodontic materials into periapical tissues during root canal therapy is common, often triggering biological responses such as inflammation, foreign body reactions, and bone alterations. Understanding these reactions is crucial for evaluating the safety of endodontic materials and minimizing complications.
Methodology: Bone tissue reactions to six endodontic materials were evaluated in 21 Wistar rats, with three animals per group. The groups included: Group 1 - Resin-based sealer (Sealpex), Group 2 - Calcium hydroxide-based sealer (Sealapex), Group 3 - Silicone-based sealer (Gutta Flow 2), Group 4 - Calcium silicate-based sealer (Ceraseal), Group 5 - MTA-based sealer (MTA Fillapex), Group 6 - Gutta-percha, and Group 7 - negative control (empty cavity).
Animals were anesthetized with ketamine and xylazine. The right femur was prepared by creating a 6-mm-diameter cavity on the cortical surface, where the materials were applied according to manufacturer instructions, except for the negative control. The surgical sites were sutured after material application.
At the end of the experimental period, three animals per group were euthanized, and femurs were dissected and fixed in 10% neutral-buffered formalin for 48 hours. The specimens were processed for histological analysis to evaluate bone tissue responses.
This study provides insights into the biological effects of various endodontic materials on bone tissue, contributing to the understanding of their safety profiles in clinical practice.

Results: The results are currently awaited and will be presented at the conference

OP026 | PHYSICOCHEMICAL CHARACTERISATION AND REACTIVITY ASSESSMENT OF CALCIUM SILICATE-BASED SEALERS

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Aim: This study investigated the physicochemical properties of calcium silicate-based sealers—KometBioSeal, One-Fil, C-Root SP, and Bio-C SEALER ION+—focusing on their setting time, microhardness, reactivity over time (pH and calcium ion release), and elemental composition.

Methodology: Setting time was assessed following ISO 6876 (2012), while microhardness was evaluated using the Knoop hardness test after 7 days of setting under 100% humidity at 37°C. Reactivity over time was analyzed by immersing samples in phosphate-buffered saline (PBS) for 1h, 1-, 7-, and 28 d, followed by transfer to Millipore water for 30 min to quantify H and Ca release using a pH meter and atomic absorption spectroscopy (AAS). Elemental analysis was performed via scanning electron microscopy and energy-dispersive X-ray spectroscopy (EDS). If Al was detected, its cumulative release in Millipore water over 28d was further assessed via AAS.

One-Fil had the fastest setting time (~3h), while Bio-C SEALER ION+ had the slowest (~24h). KometBioSeal and C-Root SP set in 337 ± 8 min and 605 ± 9 min, respectively. One-Fil exhibited the highest microhardness, followed by KometBioSeal, while C-Root SP and Bio-C SEALER ION+ showed lower values. All sealers maintained alkaline pH. Calcium release peaked at 1 hour decreasing over time, except for C-Root SP, which showed minimal release. EDS analysis showed that, in addition to Ca, Si, O, and Zr, KometBioSeal and One-Fil contained Al and Cl; C-Root SP Sr, Ta, P, and Mg; and Bio-C SEALER ION+ Mg, K, and S. Al release from KometBioSeal and One-Fil was below the detection limit.

Results:

- Setting time varied among sealers.
- Microhardness was higher in sealers containing Al
- All sealers maintained an alkaline pH
- Most sealers exhibited peak calcium release after 1 hour of immersion
- Elemental composition may influence sealers'properties.
- Al release was below the detection limit, minimizing concerns about potential exposure.

OP027 | ASSESSMENT OF PHYSICAL PROPERTIES, OBTURATION QUALITY, AND CYTOCOMPATIBILITY/OSTEOGENIC POTENTIAL OF KP-ROOT SP: A NEW CALCIUM SILICATE-BASED BIO-CERAMIC SEALER

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Aim: Currently, iRoot SP is widely used calcium silicate-based bio-ceramic (CSBC) sealer. This study aims to compare the physical properties, quality of obturation, biocompatibility, and osteogenic induction characteristics of KP-Root SP (a new developed CSBC sealer) with iRoot SP.

Methodology: Both KP-Root SP and iRoot SP comply with the ISO 6876:2012 standard regarding flow, film thickness, radiopacity, and solubility. The two groups demonstrated 84%–95% canal space occupancy with root filling material. No notable differences were observed in the entire root canal, as well as in the apical and middle thirds. The KP-Root SP group contained a greater average volume of filling material in the coronal third than the iRoot SP group. Microscopic images and SEM analyses revealed that both materials exhibited no obvious gaps with dentin or gutta-percha, indicating good sealing properties. Both iRoot SP and KP-Root SP contain similar core elements in varying proportions. Additionally, KP-Root SP includes strontium. iRoot SP and KP-Root SP extracts at a concentration of 20 mg/mL have no cytotoxic effects on hPDL cells at both 24 and 48 hours. While iRoot SP and KP-Root SP promoted the release of IL-4 to induce an anti-inflammatory response, they also triggered increases in IL-6 and IL-8, reflecting a pro-inflammatory response. Both iRoot SP and KP-Root SP enhanced the osteogenic potential of hPDL cells.

Results: The results demonstrate that KP-Root SP and iRoot SP show no significant differences in terms of physical properties, obturation quality, cytocompatibility, and osteogenic potential.

OP028 | THE EFFECT OF RADIOTHERAPY ON THE PUSH-OUT STRENGTH OF DIFFERENT ROOT CANAL SEALERS

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Aim: This in vitro study aimed to assess the push-out strength of two different root canal sealers (resin-based/AH Plus and bioceramic/BioRoot RCS) concerning the timing of radiotherapy-RT (before/after root canal treatments-RCT).

Methodology: Totally 90 mandibular premolars were randomly assigned to 3 main groups (N=30) based on the timing of the radiotherapy sequence: 1) Control (non-irradiation); 2) Before-RT (irradiation prior to RCT); 3) After-RT (RCT prior to irradiation). Each main group was subdivided into two groups (n=15) according to root canal sealers: epoxy resin-based sealer (AH Plus, Dentsply Sirona) and bioceramic tricalcium silicate-based sealer (BioRoot RCS, Septodont). The prepared canals were obturated according to the manufacturers' instructions. The radiotherapy protocol was conducted with 60 Gy (2 Gy/day, five days a week) for six weeks. For push-out evaluation, dentin slices were obtained from cervical, middle, and apical thirds of each root. The test was conducted using a universal testing machine (crosshead speed:1mm/min) and bond strength was calculated. Specimens were analyzed under a stereomicroscope (20×) to determine bond failure modes. The data were analyzed using three-way ANOVA and Bonferroni's test ($p<0.05$).
For AH Plus, at coronal, Groups Control and Before-RT showed statistically higher push-out strength. At apical region, Group Control showed statistically higher push-out strength than other tested groups. For BioRoot RCS, at coronal and apical, Group Control showed statistically higher push-out strength than other tested groups. At middle, Groups Control and Before-RT showed statistically higher push-out strength than Group After-RT. Regarding root canal sealers, for Group Before-RT, at coronal, AH Plus showed statistically higher push-out strength than BioRoot RCS ($p<0.05$).

Results:
• Regardless of timing, radiotherapy might reduce the bond strength of epoxy resin-based and bioceramic sealers.
• Mostly, similar bond strengths were determined among both root canal sealers undergone radiotherapy.

OP030 | COMPARISON OF POST-OPERATIVE PAIN AND SEALER EXTRUSION INCIDENCE FOLLOWING THE USE OF BIOCERAMIC SEALER AND RESIN-BASED SEALER: A CLINICAL EVALUATION

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Aim: 1. To evaluate and compare the incidence of post-operative pain following the use of Bioceramic sealer and Resin-based sealer.
2. To evaluate and compare the incidence of sealer extrusion following the use of Bioceramic sealer and Resin-based sealer.

Methodology: Endodontic sealers play a crucial role in root canal obturation, influencing post-operative outcomes such as pain and sealer extrusion. Bioceramic and resin-based sealers have distinct properties, which may impact patient comfort and clinical success. This study compares the incidence of post-operative pain and sealer extrusion following the use of a bioceramic sealer (Guttaflow Bioseal) and a resin-based sealer (Sealapex) in root canal treatment.

Patients aged 18-65 years requiring root canal therapy were included in this study. Participants were randomly divided into two groups based on the sealer used for obturation: Group 1 (Bioceramic sealer, Guttaflow Bioseal, Coltene) and Group 2 (Resin-based sealer, Sealapex, Kerr). Post-operative pain was assessed using a Visual Analog Scale (VAS) at 0, 24 hours, 1 week and 4 weeks post-treatment. Sealer extrusion was also evaluated radiographically immediately after obturation. Data were analysed statistically to compare pain incidence and extrusion rates between the two groups.

Preliminary findings indicate that Group 1 (Guttaflow Bioseal) demonstrated a lower incidence of post-operative pain compared to Group 2 (Sealapex) at all time intervals. Additionally, no significant sealer extrusion was observed in both the groups

Results: The results suggest that the bioceramic sealer (Guttaflow Bioseal) may be associated with reduced post-operative pain compared to the resin-based sealer (Sealapex). These findings highlight the potential clinical advantages of bioceramic sealers in endodontic therapy, promoting improved patient outcomes. Further studies with larger sample sizes and long-term follow-up are recommended to validate these findings.

OP031 | GUIDED ENDODONTICS. PRINCIPLES, TECHNIQUES AND LIMITS

S. STEFANESCU

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Aim: The aim of the presentation is to raise awareness and to educate the audience about the new capabilities of the modern dentistry in solving calcified cases, encouraging dentist to detect and early treat calcified cases, or to refer for specialised approach, the more complex ones.

Methodology: Calcified canals are a common challenge in endodontic treatments, as they can be difficult or impossible to find, due to the deposition of dentine. This often leads to the impossibility of carrying out the root treatment with the subsequent loss of the tooth. These calcifications can be partial or total, both of which were impossible to treat until recently. The advent of new imagistic aids, like cone-beam computed tomography and oral scan, allowed the canals to be localised and accessed safely.
Currently there are 2 techniques: statical(classic) and dynamic guidance(modern).
The statical guidance involves the followings steps:
1. Radiographic assessment of the tooth
2. CBCT assessment of the tooth
3. Optical scan of the jaw involved – essential to determine the position of the canal related to the outer surface of the tooth
4. Data processing and stent manufacturing – superimposing the CBCT and oral scans using a special software, allowing to 3D-print the stent that will include a metal sleeve guiding the angle and the depth of the drill that will access the canal.
5. Clinical application.

The Dynamic guidance is a somehow simplified versions but a more complex one, skipping the phase of oral scan, data processing and stent manufacturing. The guidance is in real time, the face scanner corelating with the CBCT image and the jaw, following a meticulous calibrating process.

Results: The advantages of the procedure are:
- Safer
- Minimal invasive
- Predictable
- Quicker
- Not user sensitive

Disadvantages:
- Equipment sensitive

Whereas the dynamic guidance has no limitations, the statical one is limited to the front teeth.

Thank you

OP033 | EVIDENCE BASED PARADIGM SHIFT IN ROOT CANAL THERAPY

S.S. BHANDARI

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Aim:
• To determine the most effective irrigation technique for root canal treatment that optimizes the interaction between hydraulic cement sealers (HCS) and dentine.
• To investigate the impact of different irrigation protocols on the antibacterial properties of dentine and HCS sealers.
• To evaluate the influence of irrigation on the tooth-sealer interaction at the interface.

Methodology: This research evaluated the effects of three irrigation protocols –
1) 5.25% NaOCl (Chloraxid; Cerkamed) used in between instruments followed by a final rinse of 17% ethylene diamine tetracetic acid 17% (Endo Solution, Cerkamed) - NaOCl-EDTA
2) 5.25% NaOCl with the addition of 9% 1-hydroxyethylidene-1,1-diphosphonic acid (MedCem) used in between instruments - NaOCl+HEDP,
3) Distilled water
Human single rooted teeth were split longitudinally and reassembled. They were prepared using Wave One Gold rotary (Dentsply Sirona) file series, irrigated and obturated using single cone obturation technique and the different sealers (AH Plus (Dentsply DeTrey), BioRoot RCS, BioRoot Flow (Septodont), and TotalFill (FKG Dentaire).. The teeth were incubated in 5ml Hank's Balanced salt solution for 7 days. After aging, the teeth were reopened and a number of techniques including scanning electron microscopy, energy dispersive spectroscopy, and Fourier transform infrared spectroscopy were used to analyse the microstructural and chemical changes at the dentine-sealer interface. Additionally, a direct contact test was conducted on sealer retrieved after contact with irrigated dentine to assess the antimicrobial properties of the sealers after exposure to the various irrigation protocols.

Results:
• HCS demonstrated less reliance on chelator-based irrigating solutions for optimal adaptation to dentine at the interface.
• All sealers exhibited a reduction in their antimicrobial effectiveness when in contact with irrigated dentine.
• The irrigation techniques effected the interfacial characteristics and antimicrobial properties of root canal sealers indicating that the selection of appropriate irrigation protocols for clinical practice are required to optimize treatment outcomes.

OP034 | EFFECT OF HEAT AND IRRIGATION AGITATION ON THE SMEAR LAYER REMOVAL ABILITY OF CALCIUM HYPOCHLORITE: A SCANNING ELECTRON MICROSCOPE STUDY

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Aim: This study aims to evaluate the smear layer removal efficacy of calcium hypochlorite solution in root canal treatment and examine the impact of heat and agitation techniques on its performance.

Methodology: In this study, 160 single-rooted, straight mandibular premolars were prepared using ProTaper Next rotary files up to X4. Following preparation, samples were randomly branched into 10 groups of 16 teeth each. 5.25% calcium hypochlorite was used at 3 different temperatures: non-heated, preheated, and intracanal heated. As agitation techniques XP-Endo Finisher, EDDY and Passive Ultrasonic Irrigation were used. The teeth were divided into 2 longitudinal sections and examined under a scanning electron microscope at x1000 magnification. The control group exhibited the highest smear layer retention in all regions, while the intra-canal heated PUI group provided the most effective cleaning in all areas. The results showed that heating calcium hypochlorite and using agitation techniques is more effective for smear layer removal.

Results:
-Agitation techniques improve smear layer removal.
-Increasing irrigant temperature is an efficient method for smear layer removal.
-Calcium hypochlorite represents a novel solution that requires further investigation through in vitro and in vivo studies to fully elucidate its potential.

OP035 | ONE-WAY MEMBRANE DECOMPRESSION FOR VITAL PULP PRESERVATION IN IRREVERSIBLE PULPITIS

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Aim: To present the clinical outcomes of vital pulp therapy in cases of irreversible pulpitis using an innovative one-way membrane decompression technique, while discussing its key components and potential mechanisms.

Methodology: Three adult patients with irreversible pulpitis underwent vital pulp therapy using the one-way membrane decompression technique. The inflamed dental pulp was exposed under microscope and a one-way membrane was used to seal the pulp chamber, allowing for the drainage of interstitial fluid while preventing oral microbial contamination. The drainage was maintained for 2-4 days, and after the inflammation subsided and the pulp tissue recovered, the affected tooth was repaired using composite resin with vital pulp preservation. Two patients were followed up for a period of 4 years, while one patient was followed up for 6 years. All patients reported no discomfort and normal functioning of the treated teeth. Intraoral examination revealed a normal response to cold testing and electric pulp tests. X-ray examination showed a physiological periodontal ligament space with no evidence of periapical lesions. This case series illustrates a successful outcome of vital pulp therapy in irreversible pulpitis through continuous decompression in the presence of oral microbial contamination.

Results:

1. Interstitial hypertension in the pulp chamber, caused by the inflammatory response and oral microbial contamination, are significant factors leading to pulp necrosis.
2. The one-way membrane is a multi-layered, interwoven porous product that seals the pulp chamber, allowing for drainage of interstitial fluid while protecting against oral microbial contamination.
3. Drainage is maintained for 2-4 days, allowing the inflammation to subside and the pulp tissue to recover. The affected tooth is then repaired using composite resin, while preserving the vitality of the pulp.
4. The potential mechanism of this new technique in vital pulp therapy is to alleviate interstitial hypertension and promote resolution of inflammation and recovery of pulp tissue.

OP036 | MANAGING WEEPING CANALS: A PRACTICAL ALGORITHM AND CASE SERIES

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Aim: To introduce a structured, stepwise algorithm for managing weeping canals in endodontic treatment, minimizing chair time while optimizing clinical outcomes.

Methodology: Persistent intracanal exudation, commonly referred to as weeping canals, presents a significant challenge in endodontics, often delaying obturation and complicating treatment. Despite various interventions described in the literature, a standardized, practical approach is lacking. This presentation proposes a systematic algorithm designed to effectively manage weeping canals, improving treatment efficiency and patient outcomes.

The proposed approach begins with full chemo-mechanical preparation, active intracanal aspiration, and placement of a creamy calcium hydroxide dressing during the first visit. If exudation persists, packed calcium hydroxide is used for an extended period at the second visit. For refractory cases, a combined non-surgical and surgical approach is employed, including apical curettage and biofilm removal tailored to apical morphology, alongside orthograde root canal obturation.

A series of clinical cases is presented to illustrate the algorithm's application. These cases demonstrate successful resolution of persistent exudation using the structured protocol, with radiographic healing, symptom resolution, and restored tooth function observed in follow-ups up to 15 months.

This algorithm provides an evidence-based, reproducible method while addressing the limitations of previously reported interventions, such as prolonged calcium hydroxide use. By implementing a structured approach, clinicians can reduce chair time, enhance patient outcomes, and manage weeping canals more effectively.

Results:

Understanding the challenges posed by persistent intracanal exudation in endodontics.

Stepwise approach to managing weeping canals, incorporating chemo-mechanical preparation, intracanal aspiration, and calcium hydroxide application.

Recognizing when to escalate treatment to combined non-surgical and surgical interventions.

Clinical case series demonstrating the effectiveness of the proposed algorithm.

Optimizing chair time and improving patient outcomes with a structured, evidence-based approach.

OP037 | COMPARATIVE EVALUATION OF APICALLY EXTRUDED DEBRIS AMOUNT USING VARIOUS KINEMATIC WITH THREE IRRIGATION TECHNIQUES: AN IN VITRO STUDY

E. ATABAY, T.Y. YALÇIN

Istanbul University Faculty Of Dentistry Department Of Endodontics, Istanbul, Turkey

Aim: The aim of this study to compare the effect of apically extruded debris amount of various kinematic (continuous rotation, reciprocation and adaptive motion) with conventional needle irrigation (CNI), passive ultrasonic irrigation (PUI) and sonic irrigation (SI).

Methodology: 162 mandibular premolar teeth selected according to certain criteria were used in this study (n:18). Continuous rotation (ProTaper Next, Dentsply, Ballaigues, Switzerland), reciprocation (OneRECI, MicroMega, Besancon, France) and adaptive motion (TF Adaptive, SybronEndo, Orange, CA) were used for root canal shaping procedures. CNI, PUI (DTE E97, Guilin Woodpecker Medical Instrument Co., Guilin, Guangxi, China) and SI (EndoActivator, Dentsply Sirona, Baillagues, Switzerland) were used for final irrigation procedures. 9 experimental groups were created to use three different root canal shaping techniques in three different final irrigation methods. To ensure standardization in the study, root lengths (20 mm), apical preparation diameters (25/.06) of the root canals, irrigation amounts used and irrigation times were adjusted to be the same. Root canal shaping and irrigation procedures were performed after the teeth were placed in Eppendorf tubes. Two-way ANOVA and post hoc Tukey HSD tests were used for data evaluation, with statistical significance set at $p<0.05$.

According to the results, in all kinematics, reciprocation resulted in the least statistically significant ADE. In all final irrigation procedures CNI led to statistically significantly greater apical debris extrusion (ADE) than SI and PUI. Shaping with continuous rotation and using CNI for final irrigation led to the highest amount of ADE among all groups.

Results:
- ADE is influenced by both the shaping and irrigation techniques employed.
- Despite the various shaping and irrigation systems used over the years, ADE has not been prevented; however, reciprocation may be more advantageous in this regard compared to other kinematics.

OP038 | FATE OF EXTRUDED SEALER

A. ALQURAISHI

DMD, Endodontics resident, Department of restorative dental sciences, college of dentistry, Imam Abdulrahman bin Faisal, Dammam, Damman, SAUDI ARABIA

Aim: This presentation explores the implications of endodontic sealer extrusion, including its biological effect, clinical significance, and influence on treatment outcomes.
By reviewing histological findings, cytotoxicity, and postoperative complications, this work aims to provide evidence-based insights into the fate of extruded sealers and their impact on treatment success or failure.

Methodology: Endodontic sealers are essential for achieving a hermetic seal within the root canal system, preventing bacterial infiltration and ensuring long-term success. The extrusion of sealers beyond the apical constriction can lead to complications such as inflammation, delayed healing, and postoperative pain. Factors contributing to sealer extrusion include over-instrumentation, apical resorption, and thermoplastic obturation techniques.
The fate of extruded sealers varies based on their composition and biocompatibility. Calcium silicate-based sealers exhibit favorable biological properties, promoting periapical healing through bioactive mechanisms while minimizing inflammatory reactions. In contrast, resin-based and zinc oxide eugenol sealers show varying degrees of tissue compatibility, with slower resorption rates and potential cytotoxic effects.
Clinical evidence suggests extrusion doesn't necessarily compromise success but may delay healing, particularly in teeth with pre-existing apical periodontitis. The prognosis depends on multiple factors such as sealer type, extrusion volume, host response, and proximity to vital structures. Bioactive sealers show particular advantages in such cases, providing better outcomes than conventional materials.
While sealer extrusion does not always compromise treatment success, careful obturation techniques can help mitigate risks, especially in roots located near vital structures. This presentation reviews clinical cases and literature findings to highlight best practices for optimizing treatment outcomes.

Results:
-Though many cases that have had successful healing outcomes with ‘sealer puffs’, a desirable outcome is probably best achieved when obturation materials are kept within the confines of the root canal system.
-Speical care should be practiced when dealing with teeth with proximity to vital structures.

OP039 | NICKEL-TITANIUM ENDODONTIC FILES AND THEIR THERMAL TREATMENTS: FROM STRUCTURE TO CLINICAL USE

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Aim: Understand the desired properties of a shaping instrument
Present thermal treatments and the induced modifications
Highlight the clinical advantages and limitations of these instruments

Methodology: Canal shaping must adhere to fundamental objectives: preserving the original canal anatomy and maintaining the position and size of the apical foramen.
For curved canals the introduction of Nickel-Titanium (NiTi) alloy files with their super-elastic properties has enabled practitioners to meet these challenges successfully.
Instrument fracture due to cyclic fatigue or torsion is an inherent risk in endodontic procedures. In recent years manufacturers have promoted thermomechanical processes designed to optimize the properties of NiTi endodontic instruments. A scientific and clinical review of thermal treatments is essential to help both the endodontist and the general practitioner distinguish between marketing claims and genuine advancements in endodontics.
Understanding the different crystallographic structures of NiTi alloy is key to grasping its super-elasticity. The flexural study and differential scanning calorimetry research conducted by Professor Laurence Jordan on NiTi files demonstrate the reduced incidence of fractured endodontic files in my practice since adopting thermally treated NiTi instruments.
Several clinical cases will illustrate the benefits of using NiTi files with thermal treatments.
At the end of this presentation both general practitioners and endodontists will have acquired scientific insights and practical examples enabling them to make informed clinical use of NiTi files for a more predictable endodontic practice.

Results:
The super-elasticity of NiTi files is achieved through phase transformations.
Phase transformation of the NiTi alloy can occur under stress.
The thermal treatment of NiTi files shifts the phase transformation temperatures to ranges that match the operating temperature (37°C), allowing the NiTi file to maintain its super-elasticity.
With comparable taper and cross-sectional geometry, the thermal treatment of a NiTi file provides advantages for optimizing canal shaping, including a reduced risk of fracture.

OP041 | THE EFFECT OF ROOT CANAL PREPARATION SIZE OF SECOND MESIOBUCCAL CANALS ON FRACTURE RESISTANCE OF THE MAXILLARY 1. MOLAR AND 2. MOLAR TEETH

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Aim: The aim of this study is to examine the effect of enlargening the second mesiobuccal canal in upper molar teeth at different apical dimensions on the fracture strength of the tooth.

Methodology: It is known that the structural strength of teeth that have undergone endodontic treatment decreases. Excessively preparation of root canals to high tapers may predispose to fractures. Using 60 maxillary molar teeth with the presence of a second mesiobuccal canal by cone beam computed tomography, 4 experimental groups and 1 control group, each with 12 teeth and similar morphometric features, were included. In all groups, main mesiobuccal canals were prepared up to #35.04. The second mesiobuccal canals were prepared; up to #20.04 in Group1; #25.04 in Group 2; #30.04 in Group 3 and #35.04 in Group 4. In the control group, no preparation was made in the second mesiobuccal canal. Vertical force was applied to the roots with the universal testing device until they broke and the values were recorded. In the experimental groups, preparation size #20.04 showed the highest and with #35.04 showed the lowest fracture strength. According to one-way analysis of variance, it was determined that there were significant differences between the groups ($p < 0.05$). There was no significant difference in fracture strength between the control, #20.04 and #25.04 groups ($p > 0.05$). The fracture strengths in these three groups were statistically significantly higher than the #30.04, #35.04 groups ($p < 0.05$). No significant difference was observed between #30.04 and #35.04 groups. In conclusion; the use of instrument with high apical width and taper during the preparation of the second mesiobuccal canal significantly reduced the fracture resistance of the tooth due to the decrease in dentin thickness.

Results: During the preparation of mesiobuccal 2 canals, sizes exceeding 25/04 significantly reduced fracture strength.

OP042 | ENDODONTIC INSTRUMENTS MADE OF COPPER-BASED SHAPE MEMORY ALLOYS: MYTH OR REALITY?

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Aim: To enhance root canal preparation, are copper-based Shape Memory Alloys (SMA) an alternative or complementary solution to NiTi SMAs for endodontic instruments?

Methodology: Currently, root canal preparation combines the use of NiTi endodontic files with sodium hypochlorite solution. However, therapeutic failures continue to occur, due to the persistence of resistant microorganisms inside the complex anatomy of root canals. Instrument performance has been improved by optimizing geometrical parameters and NiTi performances by heat treatments, without however achieving a technological leap forward.
For over 10 years, our research group has been working on an alternative SMA solution for SMA endodontic instruments. It is copper-based SMA with a single-crystal microstructure as CuAlBe or CuAlNi manufactured by Nimesis© as wires with various diameters. In addition to their high flexibility, Cu-based SMAs present an interesting antimicrobial property. Through the development of penetration/removal and bending/torsion devices, correlated by finite element studies, we have showed that Cu-based SMA instruments have equivalent performances compared to NiTi based ones, particularly bending flexibility.
Thanks to their composition, copper-based SMA endodontic instruments possess formidable bactericide power. It leads to a much more efficient disinfection when combined with hydrogen peroxide via the reactive oxygen species-generating Fenton reaction. We observed a 6-log reduction in CFU after 3 minutes on planktonic cultures of Enterococcus faecalis, and a radius of action well more than the size of a root canal on biofilms grown on hydroxyapatite blocks.
This new combination offers a different vision of root canal preparation, one that is more conservative in terms of hard tissue, faster in terms of anti-microbiological action, and less aggressive for surrounding tissues.

Results:
- Single crystal copper-based SMA endodontic files possess interesting mechanical response during root canal preparation.
- Associated with hydrogen peroxide, their strong antimicrobial activity suggests a more effective approach to endodontic infections.

OP043 | MICROSTRUCTURAL AND ELEMENTAL EXAMINATION OF VARIOUS BIOCERAMIC SEALERS USING SEM/EDS ANALYSES

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Aim: This study aims to evaluate and compare the physical and chemical properties of three bioceramic sealers using scanning electron microscope (SEM) and energy-dispersive X-ray spectroscopy (EDS).

Methodology: In this study, AH Plus, Bioserra, and EndoArt bioceramic sealers were used. The materials were placed into standardized silicone molds and allowed to set under moist conditions for 24 hours. Following this, the specimens were incubated at 37.5°C with 100% humidity for an additional 72 hours to ensure complete chemical setting. After setting, the samples were mounted onto carbon conductive tape and examined under a SEM at magnifications of 5000×, 10,000×, 20,000× and 50,000× to evaluate particle size and structural homogeneity. Elemental composition of the materials was subsequently analyzed using EDS.

The surface morphology of materials revealed an irregular and non-homogeneous distribution of micro-sized particles. Particle sizes ranged from 170 to 2400 µm for AH Plus, 110 to 2800 µm for Bioserra, and 120 to 1300 µm for EndoArt bioceramic sealers. EDS analysis confirmed the presence of carbon, oxygen, calcium, and a high concentration of zirconium as a radiopacifier in all materials. However, EndoArt exhibited the lowest zirconium content among the three sealers. Additionally, while all materials contained low levels of nickel and aluminum, the highest concentrations of these elements were detected in EndoArt.

Results: All bioceramic sealers had exhibited irregular, micro-sized particles with distinct surface morphologies that were non-homogeneously distributed. All the experimental sealers comprised mainly carbon, oxygen, calcium and zirconium as a radiopacifier.

OP044 | ROLE OF BIOCERAMIC ENDODONTIC SEALERS IN ROOT CANAL TREATMENT FOR PATIENTS WITH INTELLECTUAL DISABILITIES

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Aim: Understand how the single cone obturation technique with Bioceramic sealer can help for patient with intellectually disabilities.

Methodology: Patient with intellectually disabilities present more extracted teeth than the general population, this is partly because this population is more prone to dental decay. Besides, dental practitioners offer more radical interventions for patient with mental disabilities in cases where conservative management would typically be proposed for healthy patients (Camoin et al, 2020) . Endodontic treatments are commonly excluded from therapeutic option because of difficulty to perform it according to recommendation (Yap et al, 2015).
Obturation is a crucial step of root canal treatment. It permits to maintain cleaning and shaping efficiency. Traditional recommended obturation techniques are three kinds: lateral condensation (CLC), warm vertical condensation (WVC) & warm lateral condensation (WLC). All are rigorous and time consumer.
Within our special needs patient consult, we take a conservative approach and want to perform endodontic without compromise. However, we encountered regular difficulties with our patients in a vigilant state during root canal treatment, particularly during filling. Patients with mental disabilities may be tired and presented show signs of impatience. Risks are wrong sealing and his consequences leading to unachievable retreatment.
Recently, single cone obturation technique with Bioceramic sealer emerged and offer a paradigm change in filling technique. Gutta Percha becomes a way to push bioceramic sealer in every root canal irregularity. This technique seems to be safer, quicker (Komabayashi et al. 2020) and offered at least the same outcome than traditional obturation technique (Zamparini et al. 2024). Last advantage, composite restoration can be realized in the same session without sanding.
This kind of filling permits to carry out root canal treatment safely on populations for which extraction was too often the chosen solution.

Results:
Root canal treatment
Disabilities patient
Bioceramic sealer

OP045 | ENDODONTIC MICROSURGERY: TRANSFORMING FAILURES INTO OPPORTUNITIES FOR SUCCESS

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Aim: This presentation aims to demonstrate how advanced microsurgical techniques can save teeth traditionally considered unsalvageable. By presenting cases with extreme anatomical and clinical challenges, this work highlights the cutting-edge modern methodologies and decision-making frameworks that push the boundaries of what's achievable in endodontics.

Methodology: A selection of complex clinical cases, including those previously deemed untreatable due to failed orthograde or surgical treatments, were managed using mordern microsurgical techniques. Root-end resections, deep retrograde cavity preparations, and the use of biocompatible materials were performed under enhanced magnification and illumination. Special attention was given to novel strategies for overcoming challenges such as long posts, separated instruments, calcifications, and complex root morphologies. Clinical videos will showcase the techniques involved and the strategies employed to overcome specific challenges while at the same time extend the limits of the endodontic treatment.

Results: The results challenge traditional boundaries in endodontic treatment. Healing outcomes, evaluated clinically and radiographically, underscore the success of these techniques even in cases with severely compromised prognoses. Highlights include the successful management of teeth with atypical root anatomy, long posts, separated instruments, and failed surgical procedures. Retrograde cavity preparations extending up to 9mm effectively replicate canal cleaning and shaping from the apex, delivering not only excellent but also predictable outcomes. These results emphasize the critical role of technical mastery and strategic decision-making in achieving success.

Conclusions: Endodontic Microsurgery represents a paradigm shift in managing failures and expanding treatment possibilities. By integrating modern instruments, cutting-edge techniques, and advanced clinical skills, clinicians can offer patients alternatives that were once thought impossible. This presentation invites the audience to challenge traditional approaches and embrace surgery as a conservative treatment option.

OP046 | ENDODONTIC MANAGEMENT OF HORIZONTAL ROOT FRACTURES

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Aim: Horizontal root fractures are complex traumatic dental injuries that impact the pulp, dentin, cementum, and periodontal ligament, often resulting from direct trauma. Successful outcomes could be achieved with timely and correct interventions. The objective of this presentation is to provide an overview of contemporary endodontic
treatment strategies of horizontal root fractures with case presentations, illustrating their application and outcomes.

Summary: Horizontal root fractures are a complicated condition involving dentin, enamel and cementum tissues. We diagnose horizontal root fractures using periapical x-rays and advanced imaging modalities such as cbct as an adjunct, and our main aim is to stabilise the coronal fragment, preserve the vitality of the pulp, promote an ideal healing pattern between the fracture fragments and ensure the survival of the tooth. In this direction, there are many important details that affect the healing and survival of the tooth. Some of these are the part of the tooth where the fracture line is located, the presence or absence of bacterial invasion into the coronal pulp tissue from the impaired epithelial attachment, our splinting techniques and duration during treatment, and
choosing the right endodontic treatment procedures. In this presentation, you will be able to find answers to many questions about how we should approach teeth with horizontal root fracture in general through our case report.

Key Learning Points:

• Clinical evaluation and CBCT are essential for identifying fracture location and severity.
• Management varies from splinting to endodontic or surgical approaches based on pulp vitality and fracture position.
• Early intervention and proper case selection improve long-term success.

OP047 | ENHANCING ENDODONTIC DIAGNOSIS: THE ROLE OF ADVANCED IMAGING IN DETECTING TOOTH FRACTURES

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Aim: The presentation aims to explore how advanced imaging technologies and AI enhance the diagnosis of tooth fractures in endodontics, improving treatment planning and patient outcomes through increased accuracy and personalized care.

Methodology: In endodontics, precise diagnosis of tooth fractures is essential for effective treatment planning. Advanced imaging technologies like Cone Beam Computed Tomography (CBCT) offer high-resolution images of tooth structures, significantly improving diagnostic accuracy. These technologies are particularly beneficial in identifying complex fractures that may not be visible on standard radiographs.
Artificial intelligence (AI) plays a key role in refining this diagnostic process. AI algorithms analyze imaging data to identify subtle fracture signs, enhancing both diagnostic consistency and accuracy. The integration of AI with advanced imaging reduces the risk of missed fractures, ensuring a comprehensive evaluation of all potential fractures.
An accurate fracture diagnosis enables endodontists to make informed, personalized treatment decisions, whether it involves root canal therapy or tooth extraction. By combining AI with advanced imaging, endodontists can deliver more precise and effective care, potentially improving patient outcomes and minimizing the need for further interventions. This approach not only streamlines diagnosis but also enhances overall patient care and treatment efficacy.

Results: Advanced Imaging: Imaging technologies such as CBCT provide detailed views of tooth structures, enhancing diagnostic accuracy.
AI Role: AI algorithms analyze imaging data to detect subtle fractures, improving consistency and accuracy.
Treatment Impact: Accurate diagnosis informs personalized treatment decisions, such as root canal therapy or extraction, potentially improving patient outcomes by ensuring appropriate interventions. This integrated approach streamlines the diagnostic process, leading to more effective care for patients with fractured teeth.

OP048 | A COMPARISON OF THE EFFECT OF CALCIUM HYDROXIDE APEXIFICATION VS. MTA BARRIER ON THE PREVALENCE OF CERVICAL ROOT FRACTURES

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Aim: To evaluate the occurrence of cervical root fractures in necrotic immature permanent teeth treated by either Mineral Trioxide Aggregate (MTA) apical barrier or Calcium Hydroxide Ca(OH)2 apexification among young patients. The null hypothesis was that more cervical fractures will be found in the Ca(OH)2 apexification group compared with the MTA apical barrier group.

Methodology: This retrospective study analyzed the medical records of 48 patients (25- MTA group and 23- Ca(OH)2 group) who underwent apexification and subsequent root canal treatment for traumatized anterior teeth between 2005-2012. Patients age ranged from 7-10 years.
The mean follow-up periods were 3.5±2 years for the MTA group and 4.2±1.9 years for the Ca(OH)2 group. Data collected included the type of material used, the stage of root development, age, sex and the type of coronal restoration. Statistical analysis using descriptive statistics, student t-test for quantitative variables, and Fisher's exact test and ANOVA for categorical variables was performed, with statistical significance set at $p<0.05$.
In the MTA group, one tooth (4%) was extracted due to a cervical fracture. In the Ca(OH)2 group, two teeth (8.7%) were extracted due to cervical fractures. Overall, the prevalence of fractures was 6.2% across both groups. There was no significant difference in the rate of cervical fractures between the groups ($p>0.05$). Other reasons for failure included external root resorption and periapical lesions.

Results: The findings of this retrospective study rejected the null hypothesis. Therefore, the choice of apexification material based solely on the risk of cervical root fracture may not be justified. Other clinical considerations, such as the number of appointments, the need for root canal disinfection,the time required for apical barrier formation, as well as the potential weakening of the root due to loss of tooth structure may influence the appropriate material for the treatment of traumatized,necrotic immature teeth.

OP049 | MICROCOMPUTED TOMOGRAPHIC EVALUATION OF SIX NITI FILES ON THE PERICERVICAL DENTIN AND THE SMALLEST DENTIN THICKNESS ZONES IN MESIAL ROOT CANALS OF MANDIBULAR MOLARS: AN IN VITRO STUDY

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Aim: Evaluate the action of six files on the pericervical dentin (PCD) and the smallest dentin thickness zones (SDTZ) in mesial root canals of mandibular molars.

Methodology:
Sixty mandibular molars with Vertucci configurations were allocated in 6 experimental groups of 10 molars and 20 mesial root canals. Specimens were scanned before and after instrumentation using SkyScan 1275 (Bruker microCT, Kontich, Belgium). Group 1 was treated with Wave One Gold (WG), group 2 with Reciproc Blue (RB), Group 3 with TRUShape (TS). group 4 with XP-endo Shaper (XP), group 5 with iRace (IR), and group 6 with TruNatomy (TN). The images recorded were reconstructed with NRecon v.1.7 and analyzed with CTAn v.1.20.8 software (Bruker micro-CT), quantifying the changes produced in surface, volume, thickness, SMI, and centroids at the PCD area of root canals located from the root canal orifices at the floor of the pulp chamber to 4 mm in the apical direction and the changes in the SDTZ located from the furcation to 4 mm and 7 mm in the apical direction. The data obtained were compared using Wilcoxon and ANOVA with a 5 % significance level.
Results.
XP and TN were similar in all the parameters at the PCD, but TN showed significant differences from WG, RB, TS, and IR. WG's action significantly differed from that of XP and TN in the cervical1/3 of the ML canal.
Conclusions.
XP and TN rotatory files with small taper and volume produced minor changes at the PCD and SDTZ, while the WG reciprocation file produced significant changes. All the files were maintained centered at the PCD, and their performances were safe with a minimal thickness higher than 0.5 mm at the SDTZ and without risk of perforation.

Results: The knowledge obtained from this study contributes to the conservative performance of endodontics treatments.

OP050 | COMPARISON OF THE EFFECTIVENESS OF DIFFERENT NICKEL-TITANIUM BASED INSTRUMENT SYSTEMS IN SHAPING THE PALATINAL ROOT CANALS OF UPPER FIRST MOLARS

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Aim: This study aims to compare the shaping efficiency of different nickel-titanium (NiTi) instrument systems in the palatal root canals of extracted upper first molars using micro-computed tomography (micro-CT).

Methodology: Thirty-three maxillary first molars with 20°-30° curvature were randomly assigned to three groups based on the instrument system used: Group 1 – Reciproc Blue, Group 2 – K3XF and Group 3 – XP-Endo Shaper. The root canals were shaped according to manufacturers' protocols. Irrigation solutions were preheated to 37°C and applied after each instrument insertion and during final irrigation. The final irrigation sequence included 5 ml of 5.25% sodium hypochlorite, 5 ml of 17% EDTA, and 5 ml of distilled water, delivered 2 mm shorter than the working length.
Micro-CT scans were performed before and after shaping to analyze changes in root canal volume, surface area, structure model index (SMI), and untouched canal area. The data were statistically analyzed.
All systems significantly increased root canal volume, surface area, and SMI ($p<0.05$). Reciproc Blue resulted in the highest increase in root canal volume, surface area, and SMI values. However, XP-Endo Shaper exhibited the lowest percentage of untouched canal areas, indicating superior cleaning efficiency. Reciproc Blue left more untouched areas than the other systems.
While all systems effectively shaped the palatal root canals, XP-Endo Shaper showed the best cleaning performance by minimizing untouched areas. These results suggest that instrument selection significantly affects shaping efficiency and cleanliness. Further research should explore the clinical relevance of these findings.

Results:
XP-Endo Shaper resulted in the lowest percentage of untouched areas, improving overall cleaning efficiency.
Reciproc Blue exhibited the highest increase in root canal volume, surface area, and SMI values.
SMI changes suggest differences in the structural modification of root canal walls depending on the instrument system used.

OP051 | EVALUATION OF THE CENTERING ABILITY AND CANAL TRANSPORTATION IN DIFFERENTLY INCLINED J-SHAPED CANALS

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Aim: This study aimed to evaluate the centering ability and canal transportation after preparation with the Scope file series in acrylic blocks with differently inclined J-shaped canals.

Methodology: A total of 30 resin blocks (Dentsply endo-training blocks, Switzerland) with J-shaped canals were utilized in this study, categorized into three groups based on their inclinations: 20°, 30°, and 40° (n=10 per group). The Scope (Türkiye) 10 K File, R-Path File Blue, and RS Medium series were applied to all canals by a single blinded operator. Irrigation with physiological saline was performed after each instrumentation. The canals were stained with ink following the final irrigation, to facilitate differentiation between pre- and post-preparation images.
Pre- and post-preparation images were superimposed using Adobe Photoshop for precise comparison. A scaling curve was applied to each canal to ensure standardized measurement, using AutoCAD LT2024, dividing the canal length into ten equal segments. The canals were sequentially numbered from 1 to 9 starting from the apical region and evaluated regionally. In the superimposed images, the areas on the inner and outer sides of the canal curvature were measured using the ImageJ software, referencing an actual value.
All statistical analyses were performed using SPSS 29. The results indicated that transportation was directed inward in the 3rd and 5th regions, while it was outward in the 1st and 2nd regions. Additionally, centering ability was found to be optimal in the 5th and 7th regions. However, it was determined that the inclination angle did not have a statistically significant effect on these parameters ($p > 0.05$). Based on these findings, the use of the Scope file can be considered safe even in severely curved canals.

Results: Canal transportation, Centering ability, J-shaped canal, Scope file system, Nickel-Titanium (Ni-Ti), Rotary instrumentation

OP052 | CAPACITY OF EXPANDING VS. RECIPROCATING FILES FOR SHAPING VERTUCCI TYPE I VS. II CANALS OF MANDIBULAR INCISORS

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Aim: To compare the capacity of expanding files (XP-Endo Shaper, FKG [XP]) to reciprocating files (Reciproc blue, VDW [Rpb]) for shaping the canals of mandibular incisors featuring either 2 canals or one ribbon shaped canal (Vertucci type II and I [V1, V2], respectively).

Methodology: Summary: Four groups of 16 extracted mandibular incisors featuring type I or II morphology were either instrumented with expanding or reciprocating files. The protocol included instrumentation in a dummy head at 37°C, use of an electronic apex locator (RootZX, Morita), liberal use of irrigation (NaOCl 2,5%) and mechanical or sonic activation of the final irrigation (XP-Endo Finisher, FKG; Eddy, VDW). Prior to and after instrumentation the specimens were scanned using a µCT (voxel size 22µm 16bit image resolution; exaCT S130, Wenzel Metrology). The canal surface between working length and three quarters up to CEJ was categorized as Q1: instrumented mechanically, Q2: not instrumented mechanically but clean, and Q3: not instrumented mechanically and covered / concealed by debris compacted to a radiopacity equal to dentin (i.e. portions of the canal which appear to have disappeared after instrumentation). Differences between groups were tested for statistical significance using U-tests with Bonferroni-Holm adjustment.
The lowest percentage of Q1 was observed for group V1-Rpb (64.1%; 56.7% - 72.7%) [Median, interquartile range], whereas V1-XP showed better results (81.4%; (75.2% - 86.9%). The highest percentage of Q1 was found for V2-Rpb (85.0%; 80.1% - 88.6%) and V2-XP (90.3%; 81.8% - 95.3%). V1-Rpb shows a higher percentage of Q2 (23.4%; 12.9% - 30.9%) and Q3 (6.2%; 2.6% - 19.0%) compared to the remaining groups.

Results:
- Expanding files may mechanically clean larger portions of the RC surface compared to reciprocating files
- Shaping oval or ribbon-shaped canals may be more difficult compared to multiple canals in the same tooth category

OP053 | ENDODONTIC AND BIO-OXIDATIVE THERAPY OF MEDICATION RELATED OSTEONECROSIS OF THE JAW: PATHOHISTOLOGICAL FEATURES AND A NEW THERAPEUTIC APPROACH

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Aim: To present pathophysiological, radiological and clinical features of medication related osteonecrosis of the jaw and the positive therapeutic effect of cold atmospheric plasma used in a new clinical approach.

Methodology: Medication related osteonecrosis of the jaw (MRONJ) is characterized by non-healing exposed bone area, for at least 8 weeks, in patients with a history of use of bisphosphonate and other antiresorptive or antiangiogenic agents without history of radiation exposure to the oral and neck region. Radiographic appearance showed varying form of radiolucencies and radio-opacities characterized by alveolar bone destruction (including sequestrum formation) with widening of periodontal ligament space and sclerosis and thickening of lamina dura. On the outer side of the alveolar process, cortical erosion with a dental sinus tract and increased activity of the periosteum, can be recognized. Histopathological alterations in the bone can directly and/or indirectly affect the biological condition of the dental pulp. Cold atmospheric plasma is a more or less ionized gas consisting of large number of different species: electrons, ions, radicals, neutral and/or excited atoms and molecules. It is created using the cold atmospheric plasma generator with a set of glass probes of different shapes filled with a noble gas that creates a cold atmospheric plasma field, which shows an antimicrobial and bio-stimulating effect on the surrounding tissue.

Results:

• Knowledge of histopathological alterations, radiological characteristics and clinical findings of medication related osteonecrosis of the jaw is a prerequisite for a proper approach in the therapeutic procedure.

• Use of cold atmospheric plasma, bassed on the antimicrobial effect and the newly created biological condition in the affected area, showed positive therapeutic effect in therapy of medication related osteonecrosis of the jaw.

• In order to confirm the first positive clinical experiences, further basic and clinical studies should be performed.

OP054 | ENHANCING PATIENT'S STABILITY: INNOVATION IN HEAD REST STABILIZATION TO WORK UNDER MAGNIFICATION ENSURING BOTH CLINICIAN AND PATIENT CARE

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Aim: The aim is to demonstrate an innovative model that enhance the patient's comfort and practitioner performance under magnification with a head and neck positioner device for stabilisation during intervention

Methodology: During treatment, practitioners find it difficult to stabilise the patient's head in position, which can be overcome by using neck support and a head restrainer, which also favours the practitioner to save time without refocusing the site of interest at regular intervals. We implemented a removable combined head and neck positioner device in the dental chair, which supports and stabilises the neck. The extension around the angle of the mandible restrains the movement of the head and saves time for the practitioner to refocus on the site of interest. The prototype was developed with the help of 3D printing to check for compatibility in the dental chair, followed by a final model made with TPU (thermoplastic polyurethane) – a flexible material with a neck bump cushion for comfort and slots on either side for airway circulation. A set of questions was developed for patients and operators to get the feedback and for thorough understanding of the flaws, which helped to improvise a refined product for routine clinical practice.

Results:

- Enhances patient stability, especially when using loupes and microscopes.
- Ensures focus on the intervention tooth under loupes and microscope without any interference.
- Achieves patients comfort and protection.
- Detachable model that can be used on multiple dental chairs.

OP055 | DEVELOPMENT OF NOVEL ANTI-INFLAMMATORY THERAPY TO SUPPRESS JAWBONE DESTRUCTION EXACERBATED BY INFLAMMATORY BOWEL DISEASE

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Aim: Patients with inflammatory bowel disease (IBD) have a higher prevalence of apical periodontitis (AP), often with accelerated jawbone destruction. However, the mechanisms driving this exacerbation remain unclear. In this study, we developed a colitis-AP mouse model to explore how colitis worsens AP and to evaluate anti-inflammatory therapies for improving bone loss.

Methodology: The colitis-AP model induced colitis alongside exacerbated alveolar bone destruction, characterized by the upregulation of inflammatory gene expression compared to the AP model. Notably, colitis led to increased infiltration of Ly6G positive and CD11b positive neutrophils into the alveolar bone compared to the AP group. Additionally, the neutrophil extracellular trap (NET) marker citrullinated H3, an indicator of neutrophil-driven inflammation, was further elevated due to bacterial infection from the root canal. Interestingly, Ly6G positive neutrophil infiltration was observed within the jawbone in the colitis group, suggesting that neutrophils recruited by colitis contribute to exacerbated bone destruction in the colitis-AP model. Local administration of tacrolimus, an immunosuppressive drug, via the root canal using a laser cavitation system successfully delivered the drug to the lesion, reducing neutrophil infiltration and improving jawbone destruction in the colitis-AP model. Our findings highlight the inflammatory interplay between IBD and AP, where neutrophil activation exacerbates jawbone destruction. Moreover, local anti-inflammatory treatment presents an effective strategy for mitigating therapy-resistant bone loss induced by AP in the colitis model.

Results:
• Colitis aggravates apical bone destruction in AP by promoting the infiltration of active neutrophils, thereby enhancing the inflammatory response.
• A laser cavitation system for delivering anti-inflammatory therapeutics into AP lesions could serve as a novel endodontic strategy.

OP057 | OPTIMIZING THE INTEGRATION OF VIRTUAL REALITY HAPTIC SIMULATORS: EFFECTS ON SKILL ACQUISITION, CONFIDENCE, AND STRESS IN ENDODONTIC PRECLINICAL TRAINING

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Aim: This study aimed to evaluate the influence of virtual reality (VR) haptic simulators on manual dexterity, self-confidence, and stress levels of 3rd-semester dental students during preclinical endodontic training and to determine the optimal timing for their introduction into the curriculum before or after training with artificial teeth.

Methodology: Forty volunteered dental students enrolled in preclinical endodontic training were randomly divided into two groups. Group 1 (n = 20) trained with VR haptic simulators before practicing on artificial teeth, while Group 2 (n = 20) practiced on artificial teeth first, followed by VR simulator use. Both groups received standardized lectures and demonstrations on access cavity preparation. Pre- and post-training evaluations included stress levels measured via a visual analog scale (VAS) at different phases, assessment of manual dexterity through preclinical training with artificial teeth performance scores, and self-confidence surveys. Statistical analyses were conducted with significance set at $p<.05$. Group 1 demonstrated significantly higher manual dexterity scores, and self-assessed proficiency compared to Group 2 ($p < .05$). Stress levels, measured via VAS, were notably reduced following simulator practice in both groups, with Group 1 reporting lower anxiety levels during preclinical training with artificial teeth sessions ($p<.05$). Simulator-based performance metrics were comparable between the groups ($p>.05$). Self-confidence surveys indicated that Group 1 felt better prepared and more confident in performing access cavity preparations and managing procedural challenges. The integration of VR haptic simulators before preclinical training with artificial teeth has a positive effect on students' manual dexterity along with reduced stress and increased self-confidence in clinical skills.

Results:

- Influence of VR haptic simulators on manual dexterity, self-confidence, and stress levels of 3rd-semester dental students
- Optimal timing for the use of haptic simulators by dental students
- Evaluation of the self-perspectives regarding the use of haptic simulators in dental education

OP058 | EVALUATION OF THE ACCURACY OF DIFFERENT METHODS IN DETERMINING ENDODONTIC WORKING LENGTH IN TEETH WITH SIMULATED APICAL ROOT RESORPTION

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Aim: To evaluate the accuracy of endomotor-integrated apex locator systems and electronic apex locators (EALs) in measuring root canal lengths in both straight and curved root canals with simulated apical resorption.

Methodology: This study was conducted on 67 extracted human mandibular molars carefully selected and placed in alginate molds to simulate clinical conditions. The study included teeth with both straight distal canals (0–10°) and curved mesial root canals (30–50°). Apical resorption was simulated by removing 2 mm from the apex using a diamond bur. Curved roots were designated as Group 1, and straight roots as Group 2. Actual working length measurements were performed under a stereomicroscope at 15× magnification prior to using the endomotor-integrated system (EndoRadar Pro, Woodpecker Co., Guilin, China). During canal preparation with the integrated system, measurements were initially recorded using glide path files (ProTaper ProGlider, Dentsply Maillefer, Ballaigues, Switzerland), followed by ProTaper X1 (Dentsply Maillefer, Ballaigues, Switzerland). Finally, measurements with the electronic apex locator (Dentaport ZX, Morita Co., Japan) were obtained using an ISO 20K hand file. To maintain consistency and eliminate potential confounding factors associated with other irrigants, only saline was used for irrigation throughout the procedure. Statistical analysis was conducted using SPSS software with the Chi-squared test, determining success rates within a ±0.5 mm tolerance.
As a result of the statistical analysis, no significant difference was observed between the Dentaport ZX and the integrated system. ProGlider-integrated system was more accurate in curved canals, yet without statistical significance; all systems showed similar accuracy in straight canals. No significant difference was observed in the results recorded among the devices measuring straight roots.

Results: Electronic apex locators are quite reliable devices in measuring endodontic working lenght; even if in the presence of apical root resorption. However it is useful to be careful when making measurements during endodontic treatment.

OP059 | LONG- TERM SUCCESS OF TEETH UNDERGOING INTENTIONAL REPLANTATION

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Aim: Intentional Replantation (IR) can be an alternative treatment option for teeth with poor prognosis.

The objective of this case series was to provide a scientific basis to perform IR, illustrating the possibility of IR to be an alternative option to extraction for teeth with poor prognosis.

Methodology: Intentional replantation (IR) is a concept that has been known for over a thousand years, it is defined by Grossman (1966) as an atraumatic extraction of a tooth and its reinsertion into its socket immediately after endodontic treatment and apical repair is done extra-orally.

Some authors consider intentional replantation to be a last option; whereas others consider it as another treatment modality. However, in cases where a dental implant, nonsurgical retreatment or surgical treatment is not possible, intentional replantation may be a viable treatment option.

Recent case reports have demonstrated that with good case selection, intentional replantation can be a reliable and predictable procedure. The sensitive portion of the treatment is removal of the tooth atraumatically.

The procedure of IR involves several clinical considerations. These considerations are divided into pretreatment, during treatment, and after treatment considerations.

In the presentation, some cases of Intentional replantation will be reviewed that show the feasibility of the procedure in different situations.

Results:
1. Purpose of IR
2. Indications for the Procedure
3. The Key Steps Involved:

- Tooth Extraction: the tooth is carefully extracted, maintaining the integrity of the periodontal ligament.
- Root-End Treatment: a root-end is resected, and retrograde filling is placed to seal the apex of the root. Replantation: The tooth is replanted into its original socket.
- Stabilization: The tooth is splinted for a period to allow healing of the periodontal ligament and attachment to the socket.
- Techniques and Skill Required
- Potential Complications
- Advantages and Disadvantages
- Long-Term Prognosis
- Clinical Decision-Making

OP060 | INTENTIONAL REPLANTATION OF TEETH WITH SEVERAL ENDODONTIC COMPLICATIONS

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Aim The aim of this presentation is to evaluate the prognosis of teeth after intentional replantation treatment in cases with various endodontic complications.

Methodology: Intentional replantation is defined as the controlled extraction of a tooth, followed by the evaluation of root surfaces, application of endodontic interventions, and necessary treatments, after which the tooth is repositioned into its original socket.
Case-1
A patient who had undergone two previous root canal retreatments presented with an intraoral sinus tract and periapical radiolucency in the region of tooth #16. Since the patient was scared about apical surgery and was motivated to have the tooth extracted, intentional replantation was planned.
Case-2
In the radiographic examination of a previously root canal treated tooth #37 revealed a periapical lesion and external resorption in the mesial root. Before extraction, root canal retreatment performed for the tooth planned for intentional replantation. During the retreatment procedure, apical patency could not be achieved in the mesiolingual canal, and a file fracture occurred in the distal canal.
Case-3
Radiographic examination of tooth #12 revealed a periapical lesion associated with external resorption in the mesial region of the root and a diagnosis of dens invaginatus. Intentional replantation was planned for the patient. After orthograde preparation, the obturation steps were completed extraorally.
Following extractions, root complications were assessed. Apical resections (3mm) were performed with ultrasonic tips under water cooling, and retrograde cavities were filled with MTA Plus. Replanted teeth were splinted for two weeks, and all extraoral procedures were completed within 15 minutes.
Periapical radiographs at 3-6-12-18 months showed healing and symptom resolution. CBCT scans confirmed periapical healing at 18 months.

Results:
- Intentional replantation as an alternative to surgical endodontic treatment
- Procedures involved in intentional replantation
- Long-term prognosis and clinical outcomes of replanted teeth

OP061 | USE OF A-PRF AND I-PRF COMBINATION IN REGENERATIVE ENDODONTIC CASES: A CLINICAL CASE SERIES

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Aim: To present case reports of the use of A-PRF and I-PRF in different clinical cases.

Methodology: Regenerative endodontics has been defined as a biological procedure designed to replace damaged structures, including dentin and root structures, as well as cells of the pulp-dentin complex. Platelet concentrations such as A-PRF and I-PRF may show great potential in regenerative endodontics. In this case series, seven teeth were treated with a combination of A-PRF and I-PRF or with I-PRF alone. The cases had different clinical diagnoses, such as external resorption, internal resorption, autotransplantation, immature teeth and retreatment indications. Only two teeth had previous root canal treatment, while the other teeth had necrotic pulp. All teeth underwent a regenerative endodontic treatment procedure according to 2022 AAE procedures. In cases treated with PRF combination, I-PRF was used as a scaffold material and A-PRF was used as a barrier on I-PRF at root canal orifice. In only one case, I-PRF was used with dental pulp autotransplantation obtained from a wisdom tooth with an indication for extraction. At follow-ups, all teeth were functional and asymptomatic, although there was no positive response to the vitality test at the nine-months. Radiographic controls showed improvement in periapical lesions.

Results:
- Regenerative treatment can also be successfully applied to resorbed teeth and previously treated mature teeth.
- PRF derivatives and pulp tissue obtained by dental pulp autotransplantation can be used as a scaffold material in regenerative treatment.
- The combined use of PRF derivatives may increase clinical success in complex cases.

OP062 | EFFECT OF DENTAL PULP AUTOTRANSPLANTATION IN MATURE AND NECROTIC TEETH: CASE SERIES

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Aim: To provide pulp regeneration by dental pulp autotransplantation in mature teeth with closed apex and necrotic pulp.

Methodology: Regenerative endodontic treatment aims to regenerate the pulp-dentin complex. Transplantation of the entire pulp by dental pulp autotransplantation may provide an optimal scaffold for differentiating stem cells. This case series included 4 patients (3 females and 1 male) aged 22-29 years. One maxillary lateral and three maxillary premolars with necrosis or irreversible pulpitis and indication for root canal treatment were selected. In addition, the patients had a wisdom molar that was caries-free, vital, and indicated for extraction. After opening the access cavity under rubber dam isolation, root canal instrumentation was completed using dual antibiotic solution irrigation. The third molar was extracted, the tooth was sectioned with a low speed handpiece and a diamond disc, and the extracted pulp tissue was placed in the root canal of the recipient tooth. Direct pulp capping was performed with Biodentine and access cavity was restored with resin-modified glass ionomer cement and composite resin. Patients were followed up for up to 12 months. Clinical symptoms disappeared in all patients. Periapical radiolucency was significantly reduced. However, one incisor tooth at 6 months and one premolar tooth at 9 months showed a positive response to the electric pulp test. In conclusion, the clinical and radiographic findings demonstrate the positive regenerative outcome of pulp autotransplantation in mature teeth.

Results:
• Pulp autotransplantation is a potential alternative treatment option to conventional endodontic treatment.
• The most important criterion for protocol implementation is the availability of a suitable third molar.
• It is a clinically feasible procedure and holds promise for pulp regeneration.

OP063 | MANAGEMENT OF THE IMMATURE TEETH WITH APICAL PLUG APPROACH USING MINERAL TRIOXIDE AGGREGATE

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Aim: To emphasize the importance of the management the immature teeth with open apices through the MTA (Mineral Trioxide Aggregate) plug approach according to literature review, to describe the treatment procedure and evaluate the healing of the periapical lesions related to four immature maxillary anterior teeth.

Methodology: Caries or traumatic injuries may compromise pulp vitality, resulting in pulp necrosis and periapical lesions and hamper the completion of root maturation when it occurs before the root development was accomplished. Traumatic injuries which are the most common reason for the cessation of root maturation in children with a rate of 30% mostly affect the maxillary permanent incisor teeth. Due to the wider root canals,weak and divergent dentinal walls and lack of an apical barrier, biomechanical preparation and obturation of these teeth is a challenging procedure. Consequently, treatment modalities for immature teeth include long-term calcium hydroxide application for apexification, regenerative therapies, or the use of MTA plugs. In this presentation, four maxillary anterior teeth of patients who were referred to our clinic with a history of traumatic injuries were managed with the MTA apexification procedure.This method was preferred because it allows for shorter treatment times (2-3 sessions), improves patient compliance, and MTA is a highly biocompatible material that induces hard tissue formation. Following the removal of necrotic pulp or root canal filling material, calcium hydroxide was applied to the root canals. After two weeks, apexification was performed using MTA plugs, and lesion healing was monitored. As a result, teeth treated with the MTA plug technique had a long-term survival rate, and the periapical lesions were healed.

Results:
- Teeth with open apices can remain functional and have a long-term survival rate after MTA plug application.
- Periapical lesions in immature teeth demonstrate resolution after treatment with the MTA plug.

OP064 | MANAGEMENT OF MANDIBULAR FIRST MOLAR TEETH WITH MIDDLE MESIAL CANALS: A CASE SERIES

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Aim: To emphasize the impact of additional middle mesial root canals (MMC) in mandibular molar teeth success rate of root canal therapy through the literature review and to present the management of three cases with MMC by root canal treatment or retreatment protocol.

Methodology: For successful endodontic treatment, all root canals of a tooth must be completely identified, effectively shaped, and thoroughly sealed to achieve a three-dimensional filling of the root canal system. Anatomical variations may lead to missed canals, and the presence of necrotic tissue remnants in unshaped areas is a significant factor contributing to endodontic treatment failure. Although many years it was known that the mesial roots of mandibular molar teeth typically contain two root canals, presence of the third root canal which is termed the MMC, was identified by Barker et al., along with Vertucci and Williams. In this presentation, three mandibular first molar teeth which one had failed root canal treatment because of the MMC and the others diagnosed chronic apical periodontitis was managed by primery or secondary root canal treatment. In the first case, after removing the filling material, four distinct canal orifices were revealed in the mesial root. In the second and third cases the access cavity was prepared, and three separate mesial canal orifices were identified. Following instrumentation, the MMC merged with the mesiobuccal canal, terminating at two distinct apices. Root canal obturation was performed using gutta-percha and AD-Seal sealer. At the one-year follow-up, the teeth with MMC remained asymptomatic both clinically and radiographically, with ongoing healing of the periapical lesions.

Results: Preparation and obturation of the MMC have a positive impact on the success rate of primary and secondary root canal treatment.
A comprehensive understanding of root canal configuration and its variations in mandibular molar teeth is essential for the long-term success of endodontic treatment.

OP065 | EFFECT OF CONCENTRATED GROWTH FACTOR AND PLATELET-RICH FIBRIN ON NEOANGIOGENESIS AND BONE HEALING POST-ENDODONTIC SURGERY: A RANDOMIZED CLINICAL TRIAL

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Aim: To evaluate the efficacy of concentrated growth factor in periapical bone healing through neoangiogenesis by color Doppler and CBCT after endodontic surgery and compare it with autologous platelet-rich fibrin.

Methodology: Thirty patients with an isolated periapical lesion in the maxillary anterior region indicated for periapical surgery were randomly allocated to three groups: Control, PRF, or CGF. Endodontic surgery was done, and PRF or CGF was placed inside the bone defects in the experimental groups. The volume of the bone defect and neovascularization postoperatively, at one month, three months, and six months later, were rigorously evaluated using cone-beam computed tomography and color Doppler ultrasound, ensuring the robustness of our study design.
The percentage reduction in bone defect volume at six months was highest in the CGF group (69.16 %), followed by the PRF group (64.42 %) compared to the Control group (61.17 %). While this difference wasn't statistically significant, the study revealed that CGF promotes early neovascularization compared to the PRF and control groups ($p=0.017$). Neovascularization, a critical process in bone healing, was found to be significantly accelerated by CGF. According to the findings of this study, both PRF and CGF promote early bone healing after endodontic surgery, shedding light on the importance of neovascularization in this process.

Results:
• This randomized clinical trial explored the promising potential of concentrated growth factor (CGF) and platelet-rich fibrin (PRF) in promoting early healing of bone defects following endodontic surgery.

• PRF and CGF were seen to have a more positive effect on neovascularisation following endodontic surgery.

• CGF promotes early neovascularisation compared to both PRF and control groups. This could be due to its higher and more concentrated growth factor content.

• CGFs could directly influence the neo-angiogenic response, making them a promising biomaterial for therapeutic neo-angiogenesis and tissue healing.

OP066 | DIGITAL TECHNOLOGY-AIDED ENDODONTIC MICROSURGERY: A CLINICAL RANDOMIZED CONTROLLED STUDY

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Aim: This randomized controlled clinical trial aimed to systematically compare static navigation (SN) and dynamic navigation (DN) techniques in endodontic microsurgery (EMS). The study focused on evaluating patient-centered quality of life (QoL), surgical duration, procedural accuracy, and the 1-year prognosis associated with both techniques.

Methodology: In recent years, digital navigation techniques have been increasingly utilized in EMS. The first part of the study assessed accuracy metrics, including entry/endpoint deviations, angular discrepancies, and resection length/angle variances, through the superimposition of preoperative virtual plans and postoperative CBCT reconstructions. In the second part, patient-reported outcomes were quantified using a validated VAS-based questionnaire, which assessed symptom severity (pain, swelling, bleeding) and functional impacts through daily recordings. Surgical duration was measured via osteotomy and root-end resection times. The third part involved assessing longitudinal outcomes by two calibrated endodontists using Rud-Molven 2D criteria (periapical radiographs) and modified PENN 3D standards (CBCT) at the 12-month follow-up. Results demonstrated that while both SN and DN provided similar QoL outcomes and analgesic usage, SN significantly reduced the duration of guided osteotomy and root-end resection. Furthermore, both techniques showed comparable accuracy, with DN offering superior endpoint precision. Prognostic outcomes are still under follow-up. These findings suggest that both SN and DN are effective in supporting minimally invasive EMS

Results:

1) Discuss the QoL outcomes, analgesic use, and surgical duration in patients undergoing SN and DN-aided EMS.
2) Evaluate the accuracy metrics, including entry/endpoint deviations, angular discrepancies, and roort-end resection length/angle variances, between SN and DN techniques.
3) Assess the long-term outcomes and prognosis of SN and DN-aid EMS
4) Understanding the advantages and disadvantages of the two techniques in terms of clinical effectiveness, safety, and accessibility, to provide clinicians with a basis for selecting between the two guided approaches in clinical practice.

OP067 | DOES THE USE OF L-PRF BLOCK ENHANCE PERIAPICAL BONE HEALING AFTER ENDODONTIC MICROSURGERY? A PILOT STUDY

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Aim: This study is a pilot setup to assess whether the use of Leucocyte-Platelet Rich Fibrin (L-PRF) Block in Endodontic Microsurgery (EMS) enhances periapical bone healing, potentially improving clinical outcome and post-operative pain.

Methodology:
Patients requiring EMS with a bone defect of 10 mm or more, measured on CBCT are included. The test group will undergo EMS with the placement of L-PRF block in the bone cavity, the control group will undergo EMS without graft. CBCT scans are taken before, after surgery, and at the one-year follow-up. Follow-up occurs at one, six, and twelve months, evaluating clinical symptoms and healing. The primary outcome is to compare bone healing, measured through CBCT and evaluated through criteria from Chen et al. (2015) and further modified by Azim et al. (2020). Secondary outcomes include patient-reported symptoms, pain scale assessment, healing type, success and survival rates.
Results
Four cases were included, equally divided between test and control group. At one year follow-up, all elements remained in function with no clinical symptoms. Evaluation based on the criteria of Azim et al. (2020) showed that in the test group, one case was classified as a success, the other was deemed a failure. Similarly, in the control group, one case met the criteria for success, the other was classified as a failure. Post-operative pain showed no clear difference between the test and control groups.
Conclusion
The use of L-PRF Block did not demonstrate clear advantages in terms of success rates compared to EMS without graft. Both groups showed equal distribution of success and failure. Further research with larger sample size is necessary to determine the potential benefits of L-PRF Block in EMS.

Results:
Assess L-PRF Block in EMS for bone healing.
EMS with/without L-PRF Block, 1-year CBCT follow-up.
No difference in success
No clear advantage; larger study needed.

OP068 | REGENERATIVE ENDODONTICS IN MATURE TEETH WITH PERIAPICAL LESIONS: A RANDOMIZED CONTROLLED CLINICAL TRIAL

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Aim: The aim of this study is to compare the effects of regenerative endodontic treatment performed using blood clot, L-PRF, and i-PRF as regenerative scaffolds on postoperative pain and radiographic lesion healing in mature teeth with necrotic pulp and apical periodontitis.

Methodology: A total of 45 single-rooted teeth from 36 patients with necrotic pulp and periapical lesions were included and randomly assigned into three groups (n=15 each). Working length was determined using an electronic apex locator, and canals were shaped with Reciproc Blue (VDW, Germany). Irrigation included 2% NaOCl (Cerkamed Chloraxide, Poland) and saline, followed by calcium hydroxide as an intracanal medicament. In the second visit, calcium hydroxide was removed using H-files and NaOCl irrigation activated by EndoActivator. In the blood clot (BC) group, periapical bleeding was induced with a #25 K-file, while L-PRF and i-PRF were obtained by centrifuging venous blood at 3000 rpm for 10 min and 700 rpm for 3 min, respectively. Biodentine (Septodont, France) was applied as a coronal barrier, followed by bonding and composite restoration. Postoperative pain was assessed using the Numeric Rating Scale (NRS) at 24 hours, 72 hours, and seven days. Radiographic healing was evaluated by comparing PAI scores at baseline and six months. Significant healing was observed in all groups ($p < 0.05$), with no gender differences except in the L-PRF group, where males showed less healing ($p < 0.05$). Postoperative pain peaked on day 28 in all groups ($p < 0.05$) and was lowest on day 7 in BC ($p < 0.05$). On day 3, pain was lower in BC and L-PRF than in i-PRF ($p < 0.05$), while on days 28 and 31, it was lowest in L-PRF and highest in BC ($p < 0.05$).

Results: Regenerative endodontics; L-PRF; i-PRF; blood clot; Biodentine

OP069 | EXPLORING REGENERATIVE ENDODONTIC THERAPY IN MATURE NECROTIC TEETH: CHALLENGES AND BREAKTHROUGHS

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Aim: This presentation explores the current approaches to regenerative endodontic therapy (RET) in necrotic teeth with complete root formation. It examines available evidence, clinical protocols, and potential outcomes, highlighting the challenges and future directions of this evolving field.

Methodology: Regenerative Endodontic Therapy (RET), primarily used for immature teeth with open apices, is now being considered for mature necrotic teeth. Recent advancements show that techniques such as scaffolds, stem cells, and growth factors can promote tissue regeneration. Scaffolds act as a framework for tissue growth, while stem cells play a vital role in pulp regeneration, and growth factors support cell proliferation and healing. Clinical studies indicate positive outcomes, including revascularization, dentin deposition, and periapical healing.

Despite the promising results, challenges remain in applying RET to mature teeth. One of the main obstacles is the limited presence of stem cells in mature teeth, which affects the regeneration of functional pulp tissue. Additionally, the unpredictability of pulp regeneration and the difficulty in achieving a stable biological seal are concerns.

While the potential of RET in mature teeth is significant, further research is needed to improve treatment protocols, enhance predictability, and address limitations in stem cell influx and tissue regeneration. The future of RET in endodontic practice will depend on refining techniques and understanding long-term outcomes.

Results: Biological foundations of RET in mature necrotic teeth
Clinical protocols for implementing RET in fully formed teeth
Outcomes of RET: revascularization, dentin formation, and healing
Limitations of RET in mature teeth, including stem cell availability
Future directions for improving RET protocols and predictability

OP071 | ASSESSING THE EFFICACY OF ANTIBIOTIC THERAPY: A RETROSPECTIVE STUDY COMPARING 875MG VS 500MG OF AMOXICILLIN/CLAVULANIC ACID FOR THE MANAGEMENT OF ACUTE APICAL ABSCESSES

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Aim: The aim of the study was to compare the efficacy of amoxicillin-clavulanate administered as either 875mg twice daily or 500mg three times daily for the treatment of acute apical abscesses with orofacial involvement.

Methodology: This retrospective study evaluated 61 emergency department patients presenting with acute apical abscesses and orofacial space involvement. Patients received either 875mg amoxicillin-clavulanate twice daily (Group 1 [G1], n=35) or 500mg three times daily (Group 2 [G2], n=26). Patients were monitored for complete blood count (CBC) and C-reactive protein (CRP) upon admission (T0) and after 72 hours (T1). Inclusion criteria were patients who were not allergic to amoxicillin, had no chronic diseases, received oral antibiotics only, and returned for follow up. Patients were excluded if they used antibiotics 14 days prior to admission, developed allergic reactions or severe abdominal pain, or received corticosteroid or immunosuppressive drugs. Both groups showed significant decreases in white blood cells and neutrophil counts between T0 and T1 ($p<0.001$). G2 demonstrated significantly greater improvement in these markers compared to G1 ($p=0.003$), while CRP changes were comparable between groups.
Acute apical abscess infections consist of gram-negative and gram-positive bacterial species. CBC serves as key method for assessing patients' systemic response to infection. Based on the CBC findings in this study, more frequent dosing intervals of amoxicillin-clavulanic acid provided better therapeutic outcomes. These findings suggest that administering 500mg amoxicillin-clavulanate three times daily provides more effective treatment for severe dental infections than administering 875mg amoxicillin-clavulanate twice a day, likely due to more consistent antimicrobial coverage throughout the treatment period.

Results:
1. The frequency of antibiotic administration significantly impacts treatment outcomes in acute apical abscesses, with three times daily dosing showing superior efficacy.
2. CBC parameters serve as valuable markers for monitoring treatment response in endodontic infections.
3.Understanding pharmacokinetic / pharmacodynamic principles is crucial for optimizing antibiotic therapy in endodontic infections.

OP073 | REAL-WORLD DATA IN ENDODONTICS: INSIGHTS FROM THE REONE MULTICENTER COHORT STUDY

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Aim: The REone study evaluates variations in clinical practices and their impact on endodontic prognosis. This project, a collaboration between RECOL (a French research association) and EndoData (an endodontic software), aims to build a clinical and radiological database using real-world data (RWD) collected during routine care. RWD have significantly advanced medical research by providing insights into patient outcomes in real-life settings. This study represents a preliminary step toward a long-term cohort study in endodontics.

Methodology: REone (NCT04716478) is a prospective, non-interventional French cohort study including adult patients requiring endodontic treatments, conducted in 10 private practices and 9 university hospitals. Clinical data were recorded using EndoData software.
The study lasted 21 months (9 months of patient enrollment) including 1080 patients and 1735 treated teeth.
-Vital pulp therapy (VPT): Only 1% of endodontists' procedures consisted of VPT.
-Two-visit root canal treatment: 0.95% of treatments in private practice required two -visit, compared to 24.6% in hospitals.
-Middle mesial canal (MMC): 4.9% of non-surgical treatment on mandibular molars exhibited a -middle mesial canal in private practice, while none were identified by postgraduate students.
-Treatment outcomes: 60% healed, 28.5% in healing, 6.5% uncertain, 5% failures (39% recall rate). No significant difference between private and public
These results highlight the importance of digital data collection in improving knowledge and optimizing endodontic treatments. This study demonstrated that missing or biased data, when present, can result in erroneous and unrepresentative conclusions. The next step is to enhance the quality of future endodontic databases, as this study plays a critical role in bridging the gap between clinical practice and research.

Results:
Creation of a multicenter endodontic database.
Comparative analysis of private vs. public practices.
Demonstration of the value of RWD in endodontics.

OP074 | INTERIM RESULTS OF THE PERFORMANCE AND SAFETY OF BIODENTINE ON REVITALIZATION AND APEXIFICATION: A MULTICENTER PROSPECTIVE OBSERVATIONAL CLINICAL INVESTIGATION

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Aim: Biodentine is a bioceramic material, based on tricalcium silicate, has many indications, mainly as a dentine substitute and for pulp regeneration. The aim of this trial was to measure the performance and safety of this device in different endodontic treatment indications (apexification, root-end filling, revitalization, resorption / root perforation repair).

Methodology: This is a retrospective, non-interventional, national, multicenter study based on a sample of patients with teeth treated endodontically with Biodentine (NCT05084742). The interim results presented here concern the management of open apex necrotic teeth.
The study included 144 patients treated up to 5.5 years prior to enrolment. Among them, 76 were treated for open apex necrosis tooth: 4 for revitalization and 72 for apexification. The success rate was assessed using clinical and radiographic criteria. The success rate for apexification was 77.78%. All treatments for revitalization were successful (ie. 100% success rate). No intra-operative complications were reported and only one device failure was recorded six years after treatment.
Criteria for success and failure were defined based on the literature and endodontic success was classified as: healed, not healed or healing. In this study, apexification with Biodentine achieved a high success rate, comparable to literature data. Revitalization shows promising results with a limitation due to the small sample size, which requires further study. These preliminary results confirm that Biodentine is an effective and biocompatible alternative for the treatment of open apex teeth with pulp necrosis.

Results:
- Apexification with Biodentine achieved a high success rate, comparable to data from the literature.
- Revitalizarion shows promising results with a 100% success rate, though the small sample size calls for further studies.
- Biodentine provided an effective and biocompatible alternative for managing immature teeth with pulp necrosis.
- The absence of major adverse events reinforces its safety in endodontic applications.

OP075 | COMPARISON OF PASSIVE ULTRASONIC AND SONICALLY ACTIVATED IRRIGATION METHODS IN THE TREATMENT OF APICAL PERIODONTITIS: EVALUATION OF PGE2, NO AND IL-6 LEVELS

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Aim: Today, debates about the effectiveness of Passive Ultrasonic Irrigation (PUI) and Sonically Activated Irrigation (SAI) techniques used to increase the success of root canal treatment (RCT) in apical periodontitis (AP) are still ongoing.

Methodology: The effectiveness of PUI and SAI systems was investigated in AP patients with similar infection burden and periapical lesion size (PLS) based on changes in PGE2, NO, and interleukin-6 (IL-6) levels, which are important biomarkers of inflammatory response in gingival crevicular fluid (GCF) samples.
In this superiority randomized clinical trial, sixty-six AP patients in need of primary root canal treatment and thirty healthy controls were enrolled. GCF (preGCF) PGE2, NO and IL-6 levels were measured in all participants before RCT. After chemo-mechanical canal preparation using rotary instruments and NaOCl irrigation, teeth were randomly assigned to two groups [PUI (n:33) and SAI (n:33)]. After final irrigation protocol, the same markers were again measured in GCF samples 1 week after RCT (postGCF), except for the control group. In addition, 1st order most commonly seen bacteria (FMCB) typing was performed on microbial samples taken from the root canals of the patients. One-way ANOVA, Unpaired t test and Mann-Whitney U tests were used for evaluation of inflammatory biomarkers.
There was no difference in inflammatory markers in PAI, PLS, FMCB and preGCF between the PUI and SAI groups ($p>0.05$). Unlike other markers, postGCF-PGE2 levels of the PUI group were lower than postGCF-PGE2 levels of the SAI group (331±101 vs 388±105 ng/L, respectively, $p=0.0335$).
As a result, the PUI system significantly reduced PGE2 and IL-6 levels by better controlling inflammation in the treatment of AP, therefore it was more effective than the SAI system.

Results: Apical periodontitis; Passive Ultrasonic Irrigation; Gingival crevicular fluid; Sonically Activated Irrigation; PGE2; IL-6

OP076 | TO EVALUATE THE EFFECT ON OUTCOME OF CARIOUSLY EXPOSED PERMANENT POSTERIOR TEETH TREATED WITH PARTIAL/COMPLETE PULPOTOMY USING A BIOCERAMIC MATERIAL. ERRM ENDOSEQUENCE WHEN USED IN VITAL PULP THERAPY

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Aim: To evaluate the effect on outcome of cariously exposed permanent posterior teeth treated with partial/complete pulpotomy using a bioceramic material. ERRM Endosequence when used in vital pulp therapy procedures

Methodology: The treatment for teeth with deep carious lesions is a matter of debate. The decision-making process for formulating the treatment is multifactorial depending on the diagnosis, which is usually made on the basis of patient history, clinical presentation and results of pulp tests. Pulpitis is classified as being reversible or irreversible, the irreversibility indicating an advanced state of inflammation from which the pulp cannot heal. In recent years, the term “irreversible pulpitis” has been questioned as being arbitrary. Teeth diagnosed with irreversible pulpitis or apical periodontitis have been traditionally treated by root canal treatment. However, it has been known for a long time that there is very poor correlation between signs and symptoms and actual pulpal diagnosis; the dental pulp is much more capable of healing than once thought.

– retaining vital pulp with its defensive capabilities, removing less tooth structure, and quicker treatment

There are potential advantages of following such a minimally-invasive and biologically-driven treatment protocol

completion. Moreover, clinical outcome studies have shown higher success rates for pulpotomy than root canal treatment

Full pulpotomy in mature teeth displaying signs of irreversible pulpitis has been shown to be successful with materials such as MTA, Biodentine, and CEM

This study is being undertaken with the intention of ascertaining the clinical outcome of partial and full pulpotomy in teeth with deep caries, using a bioceramic material – Endosequence BC RRM.

Results: Partial / complete pulpotomy using a bioceramic material has a favourable response on the clinical outcome in cariously exposed permanent posterior teeth

OP077 | CLINICAL AND RADIOGRAPHIC EVALUATION OF ER:YAG LASER-ASSISTED DIRECT PULP CAPPING IN CARIOUS EXPOSURE PERMANENT TEETH

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Aim: To evaluate the clinical and radiographic outcomes of Er:YAG laser-assisted direct pulp capping (DPC) in mature permanent teeth, comparing three groups: Biodentine alone, Er:YAG laser with Biodentine, and Er:YAG laser alone. The goal is to highlight the potential advantages of integrating lasers in DPC procedures

Methodology: The presentation reviews findings from a clinical study involving 42 participants undergoing DPC. The study compared three treatment modalities, assessing success through the absence of pain, sensitivity, or pathology and the presence of dentin bridge formation. Results indicated that the Er:YAG laser combined with Biodentine significantly enhanced clinical and radiographic success rates, outperforming other groups in terms of dentin bridge formation and reduced postoperative sensitivity. The presentation discusses the implications of these results for endodontic practice, emphasizing minimally invasive techniques and long-term pulp vitality preservation.

Results:

- Advantages of Er:YAG Laser in DPC:
  - Enhanced hemostasis and bacterial reduction.
  - Improved dentin bridge formation through biostimulation.
- Comparison of Treatment Modalities:
  - Er:YAG laser with Biodentine yields superior outcomes compared to Biodentine or laser alone.
  - Clinical success rates highlight the synergy between lasers and bioactive materials.
- Clinical Implications and Future Directions:
  - Potential for Er:YAG laser integration into routine DPC procedures.
  - Importance of material selection in optimizing pulp vitality and minimizing postoperative complications

OP078 | STAYIN' ALIVE!! VITAL PULP THERAPY THAT REALLY WORKS

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Aim: The aim of this presentation is to present a VPT protocol employed in the last 5 years that does not involve the use of Sodium Hypochlorite but relies on a different methodology focused on disinfection of the operatory field.

Methodology: Vital Pulp Therapy interventions have been perceived throughout the history of dental procedures as something worth doing only for young patient and only in a very limited spectrum of pulpal inflammation. The high risk of failure made root canal treatment more appealing, especially for the endodontists, even in cases where other options were possible. As technology made breakthrough after breakthrough, managing pulpal inflammation became more predictable and new protocols and techniques enriched the field of endodontics. Sadly, not many were keen on updating themselves with the new knowledge and thus VTP remained the ugly duckling. In recent years, a new trend of biologically oriented endodontics revitalized the dentist's interest in maintaing the patient's pulp and not only in removing it. Pulp caping and pulpotomies are now more foreseeable than ever, and we're going to discover that, together, during this presentation. I'm going to showcase information extracted from an extensive overview of the literature as well as from my 13 years of experience as an endodontist, who has always tried (whenever possible) to save the pulp.

Results:

1. How to properly diagnose pulpal pathology
2. How to adequately adapt a Vital Pulp Therapy protocol in accordance with the cause and severity of the bacterial contamination
3. What instruments and materials are best employed in atraumatic caries removal protocols
4. How to achieve hemostasis without the use of Sodium Hypochlorite
5. How to properly and adequately place a calcium silicate material.
6. How to restore the tooth without interfering with the bioactivity of the calcium silicate material used for VPT

OP079 | THE USE OF ER:YAG LASER FOR VITAL PULP THERAPIES

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Aim: To present the efficacy and clinical applications of Er:YAG laser in vital pulp therapies.

Methodology: Among the lasers used in vital pulp therapies, Er:YAG lasers stand out with their promising clinical outcome. For optimal results, it is important to select the appropriate laser parameters and apply the correct clinical protocols. In this presentation clinical outcome of vital pulp therapies performed using Er:YAG laser will be presented and factors affecting clinical success will be discussed.

Results:
- Advantages and limitations of using Er:YAG laser in vital pulp therapies
- Antibacterial effect of Er:YAG laser and its contribution to dentin bridge formation
- The importance of decontamination and hemostasis of the exposed pulp

OP083 | INTENTIONAL REIMPLANTATION

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Aim: To evaluate the effectiveness of intentional reimplantation as a viable and minimally invasive treatment option for resolving extruded material in cases with complex clinical presentations.

Methodology: The intentional dental reimplantation is a surgical procedure that involves the controlled extraction of a tooth, its extraoral treatment, and the subsequent reinsertion into its original socket. Some indications of this procedure are fractured instruments that cannot be removed, overfilled canals, external resorptions, among others.
In cases where apical surgery is not feasible or its prognosis is poor, intentional reimplantation is an option.

The patient presented with a previously treated tooth, acute apical abscess and facial swelling, despite having undergone recent drainage. To complement the diagnosis and provide a more accurate treatment plan, a cone-beam computed tomography (CBCT) scan was performed. Stabilizing the condition with medication was considered necessary due to the presence of signs of systemic involvement. Since the previous endodontic retreatment was unsuccessful, intentional reimplantation was chosen as the best alternative to remove the extruded material without the need for apical surgery on an intact buccal plate and a very short root.
At the one-year follow-up, the patient is asymptomatic, and bone formation is observed in the periapical area.

Results:
- Assessment of surgical and endodontic planning in intentional reimplantation. - Evaluation of intentional reimplantation as a conservative alternative
- Importance of the atraumatic technique
- Management of extraoral time to maintain the cellular viability of the periodontal ligament
- Improvement in the precision of endodontic treatment, performed directly outside the oral cavity

OP084 | THE USE AND EVOLUTION OF 3D PRINTED SURGICAL DECOMPRESSION DEVICES IN THE MANAGEMENT OF LARGE APICAL LESIONS: A CASE SERIES

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Aim: To describe the use of a digital workflow in the management of large apical lesions utilising 3D printed decompression devices through a case series.

Methodology: The development of periapical pathology is influenced by a variety of factors such as local microbiology and pathophysiology. In large lesions, orthograde endodontic treatment is often insufficient in promoting healing of the periapical tissues alone and therefore is followed by apical surgery to reduce inflammation. While traditional treatments often involve enucleation, decompression techniques have been shown to provide a less invasive alternative when combined with non-surgical and surgical endodontic treatment.

This case series describes the management of five cases which have utilised a digital workflow to fabricate novel customised decompression devices in the management of large lesions. The reduction of intra-cystic pressure alongside active irrigation reduces inflammatory compounds, contributing to a reduction in the lesion size and promoting osseus healing.

The cases encompass large apical lesions affecting maxillary anterior teeth, which are important for both function and aesthetics. They portray the use of decompression in its own right as a treatment option, whilst also discussing it's use as a key adjunct to orthograde and retrograde endodontic treatments. This improves treatment outcomes whilst minimising the need for more invasive approaches and their associated risks without increasing the rate of recurrence.

Results:

• Treatment options for large apical lesions including enucleation and decompression.

• The advantages of surgical decompression and indications for its use.

• Report on a case series which showed positive clinical and radiographic outcomes following surgical decompression across five cases.

• The use of a digital workflow in combining CBCT information with digital planning software to fabricate custom 3D printed decompression devices.

• The use of an intra-lesional irrigation protocol in reducing inflammatory markers and improving healing.

• The use of decompression preceding retrograde endodontic treatment in the improvement of treatment outcomes.

OP085 | INTENTIONAL REPLANTATION - A CASE SERIES

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Aim: Intentional replantation (IR) is an important treatment option that clinicians may consider performing in some cases of compromised teeth, that are generally considered for extraction.
The aim of this lecture is to provide the attendees with a complete overview and background of this procedure.

Methodology: IR is defined as the 'deliberate extraction of a tooth and after evaluation of root surfaces, endodontic manipulation and repair, placement of the tooth back into its original position'.
Intentional tooth replantation has some advantages, like short operation time, less cost, less bone injury, and less limitations in terms of anatomy and location. However, clinicians should consider whether IR could be performed before dental implantation for the affected teeth with intractable periapical lesions.
The indications, possible complications, pre-treatment, treatment and post-treatment considerations will be adressed.
Clinical cases will be discussed with clinical protocol presented Step-by-step.

Results:
• IR may provide a simple, less invasive and cost-effective alternative to both endodontic microsurgery and extraction alone
• Case selection for IR is very important
• The materials and techniques associated with IR have evolved considerably
• IR could potentially be performed by all dentists

OP086 | EVALUATION OF VITAL TREATMENT METHODS IN THE MANAGEMENT OF PREMOLARS AND MOLARS WITH LESIONS AND IRREVERSIBLE PULPITIS IN PATIENTS AGED 15-45

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Aim: The aim of this study is to evaluate the effectiveness of vital treatment methods for upper and lower premolars and molars in patients aged 15-45. The goal is to preserve teeth healthily using coronal amputation, pulpotomy, and extended amputation treatments, even in teeth with lesions and irreversible pulpitis.

Methodology: This study included 20 patients (10 women, 10 men), with 10 patients under 25 and 10 between 25-45 years old. Each group had five patients with apical lesions. The treatment involved rubber dam isolation, access cavity preparation with a fissure bur, and continuation with a sterile set upon reaching the pulp. Bleeding was controlled using a cotton pellet soaked in hypochlorite, followed by MTA sealing. Of the MTA seals, 18 were applied horizontally to the canal orifices, and 2 were applied vertically to cover the distal part of the canal (5 mm) and the canal orifice. Restoration was completed with flowable composite and filler composite after etching and bonding.

Different procedures were followed for two patients. In a 16-year-old patient with a lower molar lesion, bleeding was induced with an 8-size K-file to stimulate dental pulp, mesenchymal stem cells, followed by amputation. In an 18-year-old patient with a primary molar lesion (tooth 75) with no permanent tooth germ and resorbed roots, a similar procedure was performed to stimulate dental pulp and primary tooth stem cells.

Results:

Treatment Protocol: Use of rubber dam isolation, sterile set, MTA sealing, and restorative materials.

Patient Condition: Treatment process for 20 patients, approach to teeth with apical lesions, and differences according to patient age groups.

Customized Procedures: Specialized treatment methods and outcomes for different age groups.

Follow-up Results: Symptoms after 1 month and state of apical lesions after 3 months.

Success of Vital Treatment: Positive outcomes in teeth with lesions or irreversible pulpitis and reduction in apical lesions.

OP088 | ROOT CANAL TREATMENT OUTCOMES IN MIH-AFFECTED TEETH: A RETROSPECTIVE STUDY

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Aim: This presentation explores the challenges and considerations of performing Root Canal Treatment (RCT) on teeth affected by Molar Incisor Hypomineralization (MIH). It highlights how MIH influences treatment outcomes and discusses strategies to improve success rates based on clinical insights and research findings.

Methodology: Molar Incisor Hypomineralization (MIH) presents a significant challenge in endodontic practice due to the unique characteristics of affected teeth, including altered enamel and dentin quality, complex anatomy, and increased difficulty achieving effective anesthesia. These factors often complicate the prognosis of RCT in MIH-affected teeth.
This presentation will review how MIH impacts RCT outcomes, referencing findings from clinical research, including a retrospective cohort study of 418 pediatric patients. It will address the role of severe MIH in reducing treatment success and the importance of adequate coronal restorations in improving healing outcomes. Additionally, practical approaches to managing MIH cases, including strategies for diagnosis, treatment planning, and follow-up care, will be discussed to help practitioners optimize outcomes for these challenging cases.

Results:
- MIH-affected teeth pose unique challenges for RCT due to structural and biological factors.
- Severe MIH significantly reduces treatment success rates.
- High-quality coronal restorations play a critical role in enhancing healing outcomes.
- Effective treatment planning and clinical strategies are essential for managing MIH cases successfully.
- This presentation provides actionable insights for addressing the complexities of treating MIH-affected teeth, equipping practitioners with the knowledge to improve patient outcomes.

OP089 | A RETROSPECTIVE CLINICAL STUDY ON POST-ENDODONTIC PAIN: COMPARING SINGLE CONE AND LATERAL COMPACTION TECHNIQUES IN UNDERGRADUATE STUDENTS

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Aim: To compare postoperative pain after different root canal filling techniques; single cone and lateral compaction in undergraduates.

Methodology: The 200 patients' examination and follow up papers were collected and endodontic treatment on vital mandibular molar teeth treated in 2 sessions and shaped with same file system (EndoArt, inci Dental, istanbul, Turkey), obturated with same sealer, without additional final irrigation activation device was selected. A total of 59 patients requiring root canal treatment were included in the study. They were divided into two groups according to the students' chosen obturation method: the single cone technique (n=24) and the cold lateral compaction technique (n=35). Postoperative pain levels were measured using a numerical pain scale at 1, 3, and 7 days post-treatment. Statistical analyses were performed using independent t-tests and the general linear model (GLM) for repeated measures. A significance level of $P<0.05$ was considered statistically significant. There was no statistically significant difference in postoperative pain levels between the two techniques ($P > 0.05$).The interaction between filling technique and time was also not significant ($P > 0.05$).). However, time had a statistically significant effect on pain reduction ($P <0.05$), indicating a progressive decrease in pain over time in both groups.

Results: Both the single cone and lateral compaction techniques demonstrated similar clinical effectiveness in terms of postoperative pain. Since pain significantly decreased over time the primary determinant of pain reduction appears to be time rather than the filling technique itself. These findings suggest that either technique can be effectively used in clinical practice.

OP090 | RETROSPECTIVE EVALUATION OF THE FACTORS AFFECTING SUCCESS IN RETREATMENT

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Aim: This study aims to identify the factors potentially causing the failure of primary root canal treatment and to evaluate the impact of prognostic factors on the success of retreatment, focusing on treatment outcomes in terms of tooth survival and complete healing.

Methodology: The retrospective study included 240 root canal-treated teeth from 181 patients (64.1% [116] female, 35.9% [65] male, mean age 43 ± 13 years) who presented to the Endodontics Clinic of Baskent University Dentistry Faculty between April 2013 and January 2021 and underwent retreatment by a single experienced endodontist. The study also analyzed the results of clinical and radiographic evaluations conducted at least six months after retreatment.
Complete healing was observed in 92.1% of the teeth, while 6.3% showed ongoing healing, and 1.7% exhibited no improvement. The survival rate of teeth after retreatment was found to be 98.4%.
Factors evaluated in teeth undergoing retreatment—including gender, tooth type, number of canals, presence of preoperative symptoms, presence of undetected canals in the previous treatment, preparation technique, number of sessions, type of postoperative restoration, and age—did not have a significant impact on complete healing. An analysis of the relationship between the quality of the previous root canal filling and complete healing after retreatment revealed that 3 out of 5 teeth (60%) with overfilled root canals failed to achieve complete healing. The percentage of complete healing in this group was statistically significantly lower than in the other groups ($p < 0.05$). A significant correlation was found between the presence and size of preoperative lesions and complete healing in retreated teeth ($p < 0.001$).

Results: The success of retreatment may be affected by the over canal filling in the primary treatment, the presence and size of periapical lesions, and the type of preoperative restoration.

OP092 | ADULT PULPOTOMY: A NEW ERA OF MINIMALLY INVASIVE ENDODONTICS.

A.A. HAMOUDA

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Aim: The aim of this study is to explore the efficacy and safety of adult pulpotomy as a minimally invasive treatment option for vital pulp therapy, assessing its potential to enhance patient outcomes and reduce the need for more invasive procedures.

Methodology: Adult pulpotomy is a promising alternative to traditional root canal therapy for managing vital pulp tissues in mature teeth. This procedure involves the removal of the coronal pulp while preserving the radicular pulp, aiming to maintain tooth vitality and function. Recent advancements in materials and techniques have improved the predictability of this approach, with studies indicating favorable outcomes regarding pain management, healing, and long-term success rates. This abstract discusses the procedural steps, indications, contraindications, and comparative results of pulpotomy versus conventional endodontic treatments.

Results:
1. Indications for Pulpotomy: Understanding the clinical scenarios where pulpotomy can be effectively applied in adults.

2. Materials and Techniques: Review of contemporary materials (e.g., bioactive agents) that enhance the success of pulpotomy procedures.
3. Outcomes and Efficacy: Analysis of clinical studies demonstrating the effectiveness and safety of pulpotomy in preserving tooth vitality.

4. Minimally Invasive Approach: Advantages of pulpotomy in reducing patient discomfort and recovery time compared to traditional endodontic procedures.

5. Future Directions: Discussion on the potential for further research and clinical applications of pulpotomy in adult dentistry, emphasizing the need for standardized protocols.

This study reinforces the role of pulpotomy as a viable option in modern endodontics, promoting a shift towards less invasive techniques that prioritise patient comfort and dental preservation.

OP094 | USE OF A PREMIXED CASI SEALER WITH WARM VERSUS COLD TECHNIQUE IN POSTGRADUATE MASTER PROGRAM. 36 MONTHS RETROSPECTIVE ANALYSIS

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Aim: To evaluate clinical outcome at 36 months of teeth obturated with a premixed CaSi sealer associated with single cone or carrier-based technique.

Methodology: Patients treated in a postgraduate master program were analysed. Teeth were shaped with NiTi o instruments, irrigated with 5% NaOCll, 10% EDTA, final irrigation with sterile water and filled with premixed sealer (NeoSealer Flo, Avalon, USA) associated with a warm technique (carrier-based) or a cold technique (single cone). Teeth were followed up after 3, 6, 24 and 36 months. Clinical and radiographic data were obtained, and the following parameters were evaluated: preoperative Periapical Index (PAI), signs/symptoms, sealer apical extrusion, follow-up PAI score. Teeth were considered 'healthy' (PAI minor or equal 2, no signs/symptoms) or 'diseased' (PAI major or equal 3). Chi-square test was used to evaluate the outcome between these two groups.
A total of 61 root canal treatments (48 subjects, mean age 42.2 ± 15.3 years) were performed, 39 with single cone technique and 22 with carrier-based technique. At 36-month evaluation, survival rate was 94.5% and 100% in single cone and carrier-based group, respectively. Healed teeth were observed in 87% in single cone group and 8% in carrier-based group with no statistical differences (P>0.050). Apical extrusion was observed in a total of 32 teeth, 18 in single cone group (57%) and 14 in carrier-based group (44%). Partial apical resorption of the extruded sealer was observed in 14 cases, while complete resorption of extruded sealer was observed in 9 cases. Clinical outcome showed a high rate of survived and healed teeth with both types of obturation techniques.

Results: Warm carrier based obturation canbe associated with premixed sealers with similar outcomes when compared to cold techniques. Apical extrusion was not related to the used obturation techniques.

OP095 | RANDOMIZED CLINICAL STUDY OF BIOCERAMIC VERSUS EPOXY-RESIN SEALER: 6-MONTHS RESULTS

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Aim: This randomized clinical trial compared the clinical and radiographic outcomes and post-operative pain of a bioceramic-based sealer (AH Plus Bioceramic) versus an epoxy-resin-based sealer (AH Plus) in root canal therapy over 6 months follow-up.

Methodology: A total of 105 permanent teeth from ASA 1 or 2 patients were randomly allocated into two groups: Group 1 (AH Plus Bioceramic, n=53) and Group 2 (AH Plus, n=52). Standardized endodontic procedures and disinfection protocols were followed, and treatments were completed using a carrier-based technique. Radiographic evaluations were performed at baseline, 1, 3, and 6 months, with the periapical index recorded at each time point. The presence or resorption of apical sealer extrusions was also documented, and post-operative pain was assessed using the Visual Analog Scale immediately after treatment and at 24, 48, 72 hours, and one week. At the 6-month follow-up, both sealers demonstrated a high success rate: in Group 1, 83.0% of cases were healed and 17.0% were healing, while in Group 2, 84.6% were healed and 15.4% were healing. No extractions were recorded, and there were no statistically significant differences between groups regarding radiographic healing. Although apical sealer extrusion was observed in both groups, only the bioceramic group showed resorption or modification of the extruded material. Furthermore, both groups experienced a progressive reduction in post-operative pain, with slightly fewer severe cases in the bioceramic group (not statistically significant), and after 7 days, both groups reported minimal or no pain.

Results:
- Both sealers reported high success rates with no significant difference in radiographic healing.
- Only the bioceramic sealer showed resorption of apical extrusions, without impacting outcomes.
- Post-operative pain progressively decreased in both groups.

OP097 | THE EFFECT OF DIFFERENT INTRACANAL MEDICAMENTS ON POSTOPERATIVE PAIN AND PERIAPICAL HEALING IN ENDODONTIC RETREATMENT

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Aim: The aim of this study is to evaluate the effects of different intracanal medicaments on postoperative periapical healing and pain levels in teeth undergoing root canal retreatment.

Methodology: One of the main causes of root canal treatment failure is the increased bacterial load within the root canal. The formation of periapical lesions resulting from this increase is considered a criterion for treatment failure. Therefore, intracanal medicaments are used during root canal retreatment procedures to enhance the antibacterial effect. This study evaluated the effects of different intracanal medicaments on postoperative periapical healing and pain levels in teeth undergoing root canal retreatment. The study included 60 single-rooted teeth with chronic periapical lesions from 47 patients requiring retreatment. The patients were randomly divided into three groups, including a control group. Calcium hydroxide was used in the control group, calcium hydroxide combined with chlorhexidine in one experimental group, and calcium hydroxide combined with chitosan nanoparticles. Postoperative pain levels were measured using the Borg Scale at the 6th, 12th, 24th, 36th, 48th, and 72nd hours and at the end of the first week. At the end of the week, pain had completely resolved, and no statistically significant difference in pain levels was observed among the groups ($p>0.05$). The periapical healing process was evaluated radiographically at the 3rd, 6th, 9th, and 12th months. Healing was observed in all groups by the 12th month; however, healing was faster and more pronounced in the Calcium Hydroxide combined Chitosan Nanoparticles group with a statistically significant difference compared to the control group ($p<0.05$). The results suggest that the Calcium Hydroxide combined Chitosan Nanoparticles medicament may be more effective in promoting periapical healing.

Results:
All groups represented periapical healing.
Chitosan nanoparticles provided faster periapical healing.

OP098 | COMPARISON OF POSTOPERATIVE PAIN AFTER THREE DIFFERENT INSTRUMENTATION SYSTEMS IN TEETH WITH SYMPTOMATIC IRREVERSIBLE PULPITIS

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Aim: The aim of the present study was to examine the effectiveness of conventional and new-generation preparation systems on postoperative pain requiring endodontic emergency intervention in symptomatic irreversible pulpitis cases.

Methodology: Symptomatic irreversible pulpitis is a pulp disease that requires emergency intervention with high pain levels. In this study, 63 patients diagnosed with irreversible pulpitis with high pain levels (between 7 and 10 NRS levels) were assigned to three different kinematic instrumentation techniques: manual instrumentation, continuous rotation, and reciprocation. During the emergency session, root canals were prepared under local anesthesia, and the teeth were temporarily restored with glass ionomer cement. Numerical Rating Scale was given to the patients to record their pain levels at initial session and after 6, 12 hours, 1, 2, 3, 4, 5, 6 and 7 days. Patients recorded their preoperative and postoperative pain levels at regular intervals. Data obtained from the Numerical Rating Scale were analyzed to evaluate the effect of the three different kinematic file systems on postoperative pain. No statistically significant difference was found between age, gender, and tests groups ($p>0.5$). A statistically significant difference was found between initial pain level and the other time points ($p<0.5$). In conclusion, the three different shaping systems used were successful in reducing postoperative pain levels in patients presenting to the clinic with acute pain.

Results: Effective relief of acute pain and control of postoperative discomfort in endodontic emergency interventions mainly depend on adequate root canal shaping and the selection of the most appropriate instrumentation system based on the clinical condition.

OP099 | DIAGNOSTIC ACCURACY OF VERTICAL, HORIZONTAL, AND OBLIQUE ROOT FRACTURES INDUCED BY CONTEMPORARY INTRACANAL POST SYSTEMS IN TWO DIFFERENT CBCT DEVICES USING VARIOUS IMAGING PROTOCOLS

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Aim: This study aims to evaluate the diagnostic efficacy of two different cone-beam computed tomography (CBCT) devices and 18 imaging protocols in detecting various types of root fractures in mandibular premolar teeth with three different intracanal post systems.

Methodology: Vertical, horizontal, and oblique root fractures are common dental traumas that significantly affect treatment processes and clinical decision-making. CBCT plays a crucial role in detecting these fractures due to its three-dimensional imaging capability. This study assesses the diagnostic accuracy of Newtom 7G and Newtom GO devices in identifying root fractures using different voxel sizes and dose levels.
A total of 189 CBCT images were obtained using Newtom 7G and Newtom GO devices, each employing nine different imaging protocols. Three types of root fractures (vertical, horizontal, and oblique) were created in extracted premolar teeth, and three different intracanal posts (Reforpost, Splendor SAP, Repilda GT) were used for evaluation. Three independent observers assessed the images using a five-point confidence scale. Diagnostic performance was analyzed using sensitivity, specificity, positive and negative predictive values (PPV, NPV), and the area under the curve (AUC). Intra- and inter-observer agreement was evaluated using Cohen's kappa coefficient.
Both devices detected vertical fractures with higher accuracy than horizontal and oblique fractures. Smaller voxel sizes improved sensitivity and AUC values. 7G demonstrated superior diagnostic accuracy across all fracture types and voxel sizes compared to GO. The presence of intracanal posts was observed to influence image quality and fracture detection.
CBCT remains a reliable method, particularly for detecting vertical fractures. Smaller voxel sizes enhance diagnostic accuracy, while differences in device technology and imaging parameters may impact results.

Results: CBCT effectively detects vertical root fractures, showcasing the importance of device and protocol variations.
Smaller voxel sizes enhance diagnostic accuracy, improving sensitivity
Intracanal posts impact image quality and fracture detection, making them crucial factors in clinical evaluations.

OP100 | EVALUATION OF THE RELATIONSHIP BETWEEN MESIOBUCCAL ROOT CANAL CONFIGURATION AND APICAL PERIODONTITIS IN ENDODONTICALLY TREATED MAXILLARY MOLARS USING CONE-BEAM COMPUTED TOMOGRAPHY

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Aim: This study aimed to investigate the relationship between the type of root canal configuration and apical periodontitis (AP) in the mesiobuccal (MB) root of endodontically treated maxillary first and second molars. Additionally, the detection rate of second mesiobuccal canal (MB2) in these teeth was evaluated.

Methodology: The archive of the Department of Oral and Maxillofacial Radiology, Istanbul Aydin University, Faculty of Dentistry was evaluated retrospectively between January 2016 and December 2019. The study group consisted of cone beam computed tomography (CBCT) images of patients who had at least one maxillary first or second molar with fully developed roots, closed apex, and prior endodontic treatment. The canal morphology of the MB roots was determined according to the Vertucci classification, and its association with AP was investigated. Statistical analyses were performed to assess the frequency of canal configurations, AP prevalence, and their relationships with gender, age, and tooth type ($p<0.05$).

A total of 196 maxillary molars were included in the study. The results showed that 55.6% of the examined teeth had Vertucci Type I being the most common canal morphology. AP was observed in 73.46% of the teeth, but no significant association was found between Vertucci classification and AP prevalence ($p > 0.05$). Additionally, the rate of Type IV-VIII in the first molars (26.8%) was significantly higher than in the second molars (9.3%) ($p<0.05$). No statistically significant differences were found in the occurrence of Vertucci types and AP across different age groups and genders.

Results: While Vertucci Type I was the most frequently observed canal morphology, first molars exhibited a significantly higher prevalence of Vertucci Types IV–VIII, indicating that these canals can terminate in multiple foramina at the apex.

OP101 | DETECTION OF FRACTURES IN THE DANGER ZONE OF ENDODONTICALLY TREATED TEETH USING DIFFERENT CBCT DEVICES

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Ankara University Faculty of Dentistry, Ankara, TURKEY

Aim: To evaluate the effectiveness of two different cone-beam computed tomography (CBCT) devices in detecting fractures in the danger zone of endodontically treated mandibular molar teeth.

Methodology: This in vitro study compares the diagnostic performance of two CBCT devices, Newtom 7G and Newtom GO, in detecting fractures in the danger zone of endodontically treated mandibular molar teeth. The "danger zone" is a structurally weakened region in mandibular molar teeth that becomes more susceptible to fractures following root canal preparation. The study used extracted human mandibular molar teeth with mesially curved roots. Each tooth was prepared up to F3 with ProTaper Gold (Dentsply Sirona) files and filled with AH Plus (Dentsply DeTrey, Konstanz, Germany) root canal sealer and 30.06 gutta-percha. Fracture lines were created using an Instron (Norwood, MA) Universal Testing Machine.

A total of 57 CBCT images were acquired using both CBCT devices, each employing nine imaging protocols. Newtom 7G showed superior diagnostic performance and voxel size options compared to Newtom GO. Three independent observers assessed the images using a five-point confidence scale. Diagnostic accuracy was assessed using sensitivity, specificity, positive and negative predictive values (PPV, NPV). Observer agreement was analyzed with Cohen's kappa coefficient to evaluate consistency.

The tomographic images were digitally recorded for analysis. This study aims to identify which CBCT device provides the most accurate diagnostic results for detecting fractures in the danger zone of root canal-treated teeth.

Results: This study highlights the importance of selecting the right CBCT device and optimizing voxel settings to improve diagnostic accuracy in endodontic applications. The research offers valuable insights into enhancing fracture detection in root canal-treated teeth through a comparative analysis of imaging protocols. These findings support better clinical decision-making and contribute to developing more effective treatment strategies, ultimately leading to improved patient outcomes and long-term success in endodontic therapies.

OP102 | REVISION IN THE ENDODONTIC CURRICULUM THROUGH AN ACCREDITATION PROCESS

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Aim: This presentation aims to summarize the revision in the endodontic curriculum, preclinical and clinical studies as well as assessment methodologies during the Commission on Dental Accreditation (CODA) process of Yeditepe University, Faculty of Dentistry, Istanbul, Turkey.

Methodology: Innovations made in the curriculum of Yeditepe University, Faculty of Dentistry Department of Endodontics during an accreditation process are presented. The presentation highlights the requirements expected by the accrediting organization, the implementation of new didactic courses as well as changes made in the assessment methodologies used at both the preclinics and clinics. New courses as well as multidisciplinary courses were implemented to familiarize students with emerging new information. Renovations were made at preclinical labs including placement of a radiography device used for educational purposes. Didactic and manipulative skills were assessed at the end of 3rd year to make sure students were ready for student clinics. Criteria-based independent summative exams with critical errors were conducted both at the transitory exams and at the end of senior year to ensure that students have gained necessary practical and behavioral skills to serve the community. Furthermore, academic staff received a calibration exam periodically so that their assessment skills were compatible with each other.

Results:
- Accreditation of undergraduate programs are excellent opportunities for institutions for self-improvement, recognition and benchmarking. All disciplines should make the necessary revisions in their curriculum including Endodontics.
- Endodontic armamentarium should be periodically checked and updated compatible with new technology.
- Criteria-based independent exams are critical evaluation methods to ensure a student's preparedness to serve the public.
- Faculty members are expected to follow contemporary literature and emerging new information and implement them in courses as well as clinics. They should also be periodically calibrated to make a standardized and fair assessment of students.

OP103 | ENHANCING ENDODONTICS CURRICULUM FOR SYSTEMICALLY COMPROMISED PATIENTS: A FOCUS ON ONCOLOGICAL PATIENTS WITH HEAD AND NECK RADIATION

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Aim: This presentation aims to highlight the critical gaps in the current endodontic curriculum across Europe, particularly the lack of focus on managing endodontic treatment for systemically compromised patients, such as oncological patients who have undergone radiation in the head and neck area.

Methodology: While current endodontic programs extensively address treatment for various tooth types, they often overlook the specific needs of oncological patients. In these cases, ionizing radiation alters tooth structure and raises the risk of osteoradionecrosis, making extractions contraindicated. A central focus will be the root banking technique - an essential skill for endodontists facing situations where traditional extractions can lead to severe complications. The presentation will also introduce Slovenian guidelines for the dental management of head and neck oncology patients before, during, and after radiation therapy. Particular emphasis will be placed on the importance of root banking in these high-risk scenarios, where avoiding extractions is crucial to prevent osteoradionecrosis and, increasingly, medication-related osteonecrosis of the jaw (MRONJ). A curriculum shift is essential to better equip endodontists for managing patients at high risk of osteoradionecrosis and other complications. By incorporating Slovenian guidelines and emphasizing root banking, endodontic education can evolve to deliver safer, more effective care for these vulnerable populations.

Results:
1. Understanding Special Needs: Recognize how radiation impacts tooth structure and necessitates specialized endodontic approaches.
2. Skill Enhancement: Master root banking to mitigate extraction risks and severe post-radiation complications.
3. Curriculum Development: Encourage European programs to integrate training for systemically compromised patients, guided by Slovenian recommendations.
4. Adapting to Challenges: Implement rapid and precise endodontic strategies under suboptimal conditions to minimize pain and inflammation.

OP104 | STAGING CLASSIFICATION OF PULPITIS: AN INTRA-OPERATIVE BIOLOGICALLY-DRIVEN THERAPEUTIC APPROACH IN THE CLINICAL MANAGEMENT OF PULPITIS

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Aim: Propose a clinically relevant, intra-operative grading classification of pulpitis that aids in both diagnosis and treatment of pulpitis. Disease staging (DS), developed in 1970 (Gonnella et al) is a clinically oriented medical system that classifies the severity of a patient's principal diagnosis and disease.

Methodology: Proposed Staging Classification of Pulpitis

Stage 0:
Healthy Pulp
No treatment
Normal tissue

Stage 1:
Reversible Pulpitis
(RP)

Removal of etiology to bring the pulp back to normal / Restorative therapies that might include Indirect / Direct Pulp capping procedures
Transient inflammatory response to stimuli that subsides immediately on removal of stimuli

Stage 2:
Partial Coronal Pulpitis (PCP)
Partial Pulpotomy
(Partial removal of coronal pulp tissue)
Bleeding is controlled after partial pulpotomy

Stage 3:
Complete Coronal Pulpitis (CCP)
Full Pulpotomy
(Removal of coronal pulp to the level of the root canal orifice)
Bleeding is controlled after full pulpotomy

Stage 4:
Total Pulpitis. (TP)
Pulpectomy
(Removal of the entire pulp)
Bleeding persists after full pulpotomy

Stage 5:
Pulp Necrosis (PN)
with / without infection
Root canal debridement, disinfection
and aseptic root canal treatment
Absence of pulp tissue in the pulp chamber / drainage

Results:
i. The staging classification provides a clinical framework to perform evidence-based treatment selection and aids the clinician in choosing the most appropriate clinical decision.
ii.This classification describes the current pulpal disease status to the patient and clinician in an objective manner and aids is better communication.
iii.The staging classification of pulpitis would provide prognostic information to patients and facilitate a better understanding of the natural course of pulp disease and its clinical characteristics.
iv.Improves analysis of patient cohorts and clinical trials in comparing treatment outcomes based on disease stage.
v.This classification would have a positive implication in disease coding, digital record keeping, hospital/clinical management and reimbursement.

OP105 | ENDODONTIC MANAGEMENT OF SEPARATED INSTRUMENTS: A CASE SERIES

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Aim: to present causes and diverse strategies in managing separated endodontic instruments

Methodology: Fracture of root canal instruments during endodontic procedures is a common complication due to various factors, including anatomical complexities, procedural errors, and instrument fatigue such as cyclic and torsional fatigue. Effective diverse strategies in managing separated endodontic instruments must be adjusted to the specific clinical situation by selecting the most appropriate approach, namely removal, bypass, obturation of the root canal with instruments left in situ, or surgical intervention. This case series presents five different cases that highlight the importance of individualized management strategies to achieve successful clinical outcomes

Results: Separated Instruments in Endodontic

OP106 | CLINICAL MANAGEMENT OF EXTERNAL INFLAMMATORY ROOT RESORPTION : INSIGHTS FROM A CASE SERIES

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Aim: This study provides clinical insights into the management of external inflammatory root resorption (EIRR) through a detailed case series analysis. It emphasizes the role of biocompatible materials, particularly MTA, in promoting periapical healing, preventing further resorption, and ensuring long-term treatment success. By sharing clinical outcomes and practical strategies, this study aims to enhance decision-making in severe EIRR cases.

Methodology: EIRR is a destructive condition characterized by the progressive loss of dental hard tissue, often resulting from trauma, pulpal necrosis, or orthodontic treatment. It poses clinical challenges due to its rapid progression and potential to compromise tooth structure. Successful management requires precise diagnosis, thorough disinfection, and the use of materials that promote healing and prevent further resorption.
This case series describes the management of three teeth affected by extensive EIRR: one mandibular first molar and two maxillary central incisors. Each case involved tailored disinfection and obturation. For the mandibular molar, sodium hypochlorite irrigation with ultrasonic activation was used, followed by intracanal calcium hydroxide. The distal canal was obturated with tricalcium silicate-based material (MTA Angelus, Brazil), while the mesial canals were filled using cold lateral compaction. For the maxillary incisors, a similar disinfection protocol was applied. Given their single-rooted anatomy, MTA was used for obturation to create an apical barrier, ensuring a biocompatible seal and preventing further resorption.
At the one-year radiographic and clinical follow-up, all cases showed successful periapical healing, symptom resolution, and no further resorption.

Results:
- Timely and accurate diagnosis is critical for EIRR management.
- Effective disinfection is essential for successful outcomes.
- Biocompatible materials play a key role in achieving a reliable apical seal and long-term success.
- Consistent treatment protocols lead to predictable clinical outcomes.

OP107 | CONSERVATIVE APPROACH IN MANAGEMENT OF DEEP CARIOUS LESIONS.

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Aim: The aim of this case series is to show a conservative treatment for tooth presenting a symptoms like symptomatic irreversible pulpitis (SIP). Vital pulp therapy was the treatment of choice for these cases. According to updated guidelines the management of deep caries lesions which has been increasing in prevalence worldwide has changed in the aid of magnification and hydrophilic cements preserving pulp vitality has been more achievable. Increasing this awareness between the specialists and young dentists is important. These cases will present some difficulties that could be faced while selecting vital pulp therapies treating deep carious lesions.

Methodology: The cases will mainly focus on how could we diagnose and put the right treatment plan according to the effecting factors, and to approach more objectively to a subjective topic which is pain. Moreover selecting the right material and restoring the tooth probably will effect the prognosis of the treatment. As a home message the speaker will advise the audience to give vital pulp therapies a chance in such a cases which will end in saving tooth vitality, time and face less complications in the treatmentt procedure.

Results:
*Vital pulp therapy.
*Diagnostic tools.
*Histological and clinical differences of the current diagnostic systems.
* It is always worthy to save a tooth vitality.

OP109 | EXTERNAL CERVICAL RESORPTION LESIONS LINK WITH CHEMOTHERAPEUTIC AGENT BLEOMYCIN AND GRAFT VERSUS HOST DISEASE

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Aim: To discuss a unique phenomenon involving multiple external cervical root resorption 'ECCR' lesions with possible link with chemotherapeutic agent bleomycin and graft versus host disease.

Methodology: Case report involving a 42-year-old female referred to the Restorative department at the Birmingham Dental Hospital for incidental findings of ECCR. This patient has severe ECCR clearly involving the lower right second premolar, first molar, and second molar. Further CBCT imaging has been requested to investigate for involvement of additional teeth.

There is an oncology history of Non-Hodkin's Lymphoma which is now stable. Bone marrow stem cell transplant was carried out in 2006 with subsequent post-transplant complications of Graft-versus-Host Disease. No other relevant medical history.

This patient was referred by her GDP due to signs of resorption on radiographic examination. Whilst she is currently asymptomatic, on questioning she reports some mild issues of food packing in the areas. There is a moderately restored, stable dentition. There were no abnormal findings such as tenderness to percussion.

Treatment will be of that for ECCR. Restorative assessment for surgical restoration where possible. Otherwise, extraction of teeth deemed of hopeless prognosis.

Results: Presentation of multiple simultaneous ECCR lesions is rare but clinically important as it is often diagnosed at later stages with subsequent poor prognosis. It is often also misdiagnosed as caries.

The development of ECCR has been associated with traumatic dental injury, orthodontic treatment, genetic predisposition, bisphosphonate use, periodontitis, and presence of cyst and tumours. The link with Bleomycin and GvHD response is currently the main working diagnosis for this patient through diagnostic exclusion. This phenomenon has only been described as few as three times in literature.

OP110 | EFFECT OF ROOT CANAL AGITATION BY ND YAG LASER IN TEETH WITH LARGE APICAL LESIONS: CASE SERIES

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Kirikkale University Faculty of Dentistry Department of Endodontics, Kirikkale,TURKEY

Aim: To evaluate the effect in apical lesions of reducing bacterial load in the root canal complex by Nd:Yag laser with root canal agitation

Methodology: The burgeoning potential of laser technologies in dentistry, with their diverse types and applications, is a fascinating area of study. This has led to a proliferation of research into the potential and current applications of laser therapy in endodontics. In this case series, we aim to observe the healing of large apical lesions using Nd:YAGlaser for disinfection during root canal treatment or retreatment for a one-year follow-up. In this study, we have carefully followed a detailed methodology. Five teeth with large apical lesions were anesthetised, caries tissue and old restorations were removed under rubber dam isolation, and the endodontic access cavity was opened. The canal length was measured with an apex locator and verified with radiographs. After thorough instrumentation and irrigation, the canal was dried with paper points. Clean-up protocol was supported with Nd:YAG laser in the root canal, spirally advancing from apical to coronal at 2 mm per second. After the canal filling was completed, the teeth were permanently restored with composite. In the follow-up sessions, the teeth were asymptomatic and it was observed that the lesions were significantly reduced or disappeared.

Results: The role of adequate root canal cleaning in lesion healing is undeniable. However, the one-year follow-up of this case series demonsrated that the effect of root canal agitation with Nd:YAG laser on this process is not only sufficient, but also very promising, offering hope for the future of endodontic treatment.

OP111 | PROTOCOL AND SELECTION OF THE APPROPRIATE SEALING MATERIAL FOR THE SURGICAL TREATMENT OF EXTERNAL CERVICAL RESORPTION

N. FERRARO

Endodontic Society of Chile, Santiago, CHILE
Universidad Finis Terrae, Santiago, CHILE
Universidad del Desarrollo, Santiago, CHILE

Aim: To present a correct protocol for the surgical management of external cervical resorption (ECR) and the appropriate criteria for selecting the repair material.

Methodology: External Cervical resorption (ECR) is a pathology with increasing prevalence. The treatment of these lesions involves the removal of the resorptive tissue using both chemical and mechanical methods. Surgical treatment of ECR has shown the highest success rates in the literature, with a long-term prognosis of 5 to 10 years, according to published clinical studies. The absence of a standardized surgical protocol highlights the need to train endodontists on how to properly perform this procedure.
Surgical treatment or external repair may or may not include endodontic treatment, as ECR often protect the pulp tissue, making root canal treatment unnecessary in many cases. The use of specific instruments for proper soft tissue management, an adequate flap design for access, and thorough cleaning of the resorptive defect through chemical and mechanical methods are crucial for achieving a favorable prognosis.
Another critical aspect is the selection of the appropriate material for repairing the resorptive defect. Several factors must be considered, such as the material's bioactivity, its exposure to the oral environment, and, in many cases, aesthetic considerations, since the most affected teeth are often incisors.
This oral presentation aims to establish a treatment protocol for ECR and define key parameters for selecting the appropriate restoration material for resorptive defects.

Results:
- Understand the indications for the surgical treatment of ECR.
- Present an appropriate surgical protocol for ECR management.
- Identify key factors and considerations for selecting the most suitable repair material for surgical (external) ECR repair.

OP112 | ENDODONTIC MICROSURGERY REVISITED: ARE WE REALLY DOING WHAT WE SHOULD?

A. WEISSMAN

Hadassah school of dental medicine, Department of Endodontics, The Hebrew university, Jerusalem, ISRAEL

Aim: To critically evaluate the concept and characteristics of endodontic microsurgery (EMS) and propose an alternative approach.

Methodology: Over the past 30 years, EMS has focused on precise root-end management, achieving a high success rate of approximately 90%. While the rationale for resecting the apical 3 mm of the root has scientific merit, the recommendation to prepare and seal exactly 3 mm of the canal lacks strong scientific support.

Endodontic textbooks describe EMS as an extension of coronal endodontic retreatment, sharing the same objective—thorough cleaning and sealing of the entire canal space. However, EMS remains centered solely on root-end management, a paradox that has seen little challenge or evolution within the endodontic community.

An alternative technique, Surgical Retreatment (SR), introduced over 50 years ago, addresses these limitations. SR involves minimal root-end resection combined with an extended retro-preparation using hand or ultrasonic files, offering a potentially more comprehensive solution.

Results: Participants will gain insight into:

Why EMS falls short of its stated objectives.
The defining characteristics of SR.
The conceptual, technical, and outcome-based differences between EMS and SR.

OP113 | TARGETING THE APEX – A GUIDED SOLUTION

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Aim: 1. To discuss the current status and latest developments in the field of guided endodontic apical surgeries.
2. To share about our development process of static guided osteotomy and root resection capabilities using existing guided implant planning software.

Methodology: Guided surgical endodontics is a cutting-edge, computer-assisted technique designed to enhance the management of complex surgical cases. By leveraging digital technology, this method significantly improves precision and reduces complications during surgical procedures. This presentation will delve into various techniques documented in the literature, including both static and dynamic navigation methods.

One of the primary drawbacks of adopting guided technology is the substantial cost associated with acquiring the necessary hardware and software. To address this challenge, we will share our journey of adapting existing implant planning capabilities to develop guided endodontic surgery capabilities. This approach allows clinics to utilize their current assets more effectively, thereby reducing costs. We will also present clinical cases that have been successfully treated using our protocol, which involves creating a static navigation guide that defines both the osteotomy and root end resection in a single step.

Currently, there are no established guidelines on when or how to use guided surgical techniques, leaving it to the clinician's discretion to assess the potential benefits of this computer-guided approach for each case. Our aim is to expand the toolkit available to endodontists, enabling them to effectively address complex surgical challenges. By sharing our experiences and methods, we hope to contribute to the advancement of endodontic surgical practices.

Results:
1. Gain an overview of the history and latest developments in guided endodontic surgery
2. Learn how existing technology used for guided implant surgeries can be adapted for guided endodontic surgeries

OP114 | PRESENT-DAY PERIRADICULAR LASER-ASSISTED MICRO-SURGERY

Z.J. SAW

PRIVATE PRACTICE, KUALA LUMPUR, MALAYSIA

Aim: To discuss how modern present-day periradicular laser-assisted micro-surgery, as a minimally invasive approach, drastically decreases postoperative pain, promotes healing, and expands its feasibility to anatomically less accessible cases—ultimately preserving more natural teeth.

Methodology: Compared to traditional apical surgery, modern periradicular micro-surgery has achieved significantly higher success rate, reaching up to 96.8%, thanks to the use of technical advances such as dental operating microscopes, ultrasonics, and biocompatible root-end filling materials. In all efforts to further enhance its clinical success, laser technology is increasingly incorporated in contemporary protocols to transcend currently known limits and establish new frontiers.

An essential surgical objective of periradicular micro-surgery is optimal decontamination of the root-end surface and effective debridement of the surgical crypt. The bactericidal effect of laser irradiation enhances root-end surface decontamination, while laser-assisted removal of granulomatous tissue reduces bleeding in the surgical field. This improves visibility, allowing the procedure to be performed more efficiently and effectively.

In addition, laser removes tissue through precise layer-by-layer ablation with minimal collateral damage. When combined with low-level laser therapy(LLLT), it helps reduce post-operative pain and significantly accelerates healing.

While modern periradicular micro-surgery is highly predictable and successful in many cases, it remains challenging in anatomically complex or less accessible areas. In such instances, the precision and vibration-free nature of laser ablation enhance surgical accuracy and improve access to restricted areas, potentially overcoming these limitations.

Results: Laser-assisted periradicular micro-surgery employs laser throughout the procedure, including flap incision, ostectomy, root-end resection, granulomatous tissue removal, root-end surface decontamination and postoperative photobiomodulation.

Laser reduces bacterial loads, enables precise ablation, and provides biostimulatory effects, all of which contribute to improved clinical success, reduced postoperative pain and enhanced healing.

By expanding the scope of apicoectomy with laser technology, we broaden the reach of our ultimate goal of preserving natural teeth.

OP116 | KEY POINTS FOR ACCURATE DIFFERENTIAL DIAGNOSIS OF ENDO-PERIO LESIONS BY MICROSCOPIC PULPAL INSPECTION

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Aim: Endo-perio lesions by primary periodontal diseases are difficult to be distinguished from primary endodontic origins by X-ray and pulp vitality test especially in restored teeth, thus, other definitive diagnostic method is essential.
This presentation aims to show a possibility of the more accurate method for differential diagnosis of primary periodontal lesions through several clinical cases.

Methodology: Proper management of endo-perio lesions varies depending on their original pathological conditions. Management for primary periodontal lesions is different from primary endodontic infections in some points (e.g., the criteria for pulp removal, and the interval between endodontic and periodontal treatment). Therefore, differential diagnosis for these diseases is pivotal, but it can become more challenging when the tooth has already had deep caries treatment.
Endo-perio lesions initiated from endodontic reasons can occur by not only caries but infection through micro crack or dentinal tubules beneath the restoration, which is difficult to detect by X-ray as well as eyes. A positive response to electrical pulp vitality tests, one of the typical characteristics of primary periodontal lesions, may also be unreliable. It must be noted that false positive response may also be included even in primary endodontic lesions due to residual living pulp tissue.
In this presentation, several clinical cases of endo-perio lesions with vital pulp which were difficult to be diagnosed will be shown. They were successfully differentially diagnosed by the microscopic inspection of bacterial leakage beneath the restoration and direct observation of pulpal condition.

Results:
Differential diagnosis of endo-perio lesions
False positive/negative response of EPT

OP118 | CURRENT STATE OF ENDODONTIC PRACTICE IN FRANCE: A NATIONAL SURVEY

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Aim: This study assesses endodontic practice in France using a structured questionnaire focusing on demographics and treatment approaches.

Methodology: A cross-sectional survey among 1,744 French dental practitioners yielded a 25.9% response rate (n=452). Responding practitioners meeting all three criteria—dedicating >75% of their time to endodontics, receiving patient referrals, and using operating microscope —were designated “Specialists in Endodontics” (ES). Those meeting two criteria were classified as “Endodontic-Oriented Practitioners” (EO), and the remainder as “General Practitioners” (GP).

Significant differences in clinical practices emerged. Gender distribution of respondents to the survey varied: ES and EO were predominantly male (62–64%), whereas GP had a female majority (52%). Recruitment areas differed, with 56% of ES recruiting patients regionally compared to 25% of EO and 12% of GP who are recruiting more locally. Moreover, EO (80%) and GP(79%) reported higher stress than ES (65%), mostly from patient exigence ($p=0.004$). 79% of ES consider non-surgical retreatment to be their main activity, while GP mainly perform vital pulp therapy (60%, $p<0.001$). Most GP and OE treat fewer than 10 immature teeth annually (91% and 77%) while 68% ES treat more than 10 immature teeth ($p < 0.05$). Regarding irrigation, nearly all ES (98%) and 90% of EO employed an activation system compared to 40% GP ($p<0.001$). Furthermore, ES and EO predominantly used EDTA for the final rinse (71% and 73%), whereas 52% of GP used only sodium hypochlorite ($p<0.001$).

These results suggest that treatment strategies and stress levels are influenced by the practitioner's specialization. Further research is necessary to identify the underlying factors contributing to these differences, with the goal of improving referral processes and enhancing outcomes in endodontics.

Results:
Differences in patient classification and recruitment according to practice orientation
Professional stress and difficulties encountered by endodontists and general practitioners
Differences in clinical practice
Irrigation and activation methods

OP119 | WOLTERS CLASSIFICATION: RELIABILITY EXAMINATION OF A NEW PULPITIS CLASSIFICATION SYSTEM

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Aim: Different from the traditional American Association of Endodontics classification, the Wolters pulpitis classification system classifies pulpitis into 4 categories as initial, mild, moderate, and severe. The aim of this study was to test the reliability of the new Wolters pulpitis classification system.

Methodology: This study was carried out at the general endodontic training clinic of the Faculty of Dentistry, Gazi University. Patients who had been referred to the clinic were assessed with a consecutive sampling approach. Clinical and radiographical examination was done for each patient separately by 2 examiners, and clinical pulpal diagnosis were made independently for 80 patients using the Wolters pulpitis terms. The interobserver agreement was evaluated statistically. Weighted-Kappa statistics revealed almost perfect agreement between the 2 observers (equal-spaced weighted κ coefficient = 0.8118, p-value < 0.001; Fleiss-Cohen weighted κ coefficient = 0.8948, p-value < 0.001); and the ICC value was 0.945 (95% CI: 0.923, 0.961), which was interpreted as excellent agreement between the 2 observers. The results indicated a high level of reliability of the Wolters classification system for diagnosing pulpitis in clinical practice. The validity analyses are underway.

Results:
• The Wolters classification is a reliable pulpitis classification system.
• The system showed excellent interobserver agreement, supporting its applicability in the clinical setting.

OP120 | DENTAL-DEDICATED MRI IN THE DIAGNOSIS OF APICAL PERIODONTITIS AND TOOTH VITALITY: A FEASIBILITY STUDY

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Aim: To assess the diagnostic accuracy of ddMRI as an adjunct to clinical assessment and cone beam CT (CBCT) imaging.

Methodology: This study presents the first results from a feasibility investigation into the use of a novel dental-dedicated magnetic resonance imaging (ddMRI) system as an adjunctive tool for diagnosing apical periodontitis (AP) and assessing tooth vitality. Eighteen teeth in nine patients (ten healthy teeth, five non-vital teeth with suspected AP, and three non-vital teeth with no suspicion of AP) with a recent CBCT image were included. The teeth were tested for vitality and clinical signs of AP. CBCT images were assessed by three trained observers for signs of AP. The teeth were scanned using the Magnetom Free.Max Dental Edition ddMRI system (Siemens Healthineers, Erlangen, Germany), operating at 0.55T with a seven-channel dental-dedicated surface coil. Six pulse sequences optimized for periapical diagnostics were applied, with a total scanning time of approximately 19 minutes per tooth. Images were assessed by three trained observers for anatomical structure conspicuity (root tip, periapical bone and lamina dura), presence of inflammation (i.e., AP) determined by fluid accumulation in the periapical area, and pulp vitality determined by presence of signal. The assessed presence of AP and pulp vitality status on ddMRI were compared to clinical and radiological findings. Inter-modality agreement (kappa statistic) was calculated, and diagnostic accuracy evaluated though consensus between clinical findings and CBCT (reference standard). All anatomical structures were visible in all cases. ddMRI showed high diagnostic accuracy (kappa for inter-modality agreement 0.64 and accuracy 0.83 regarding pulp vitality, kappa 0.87 and accuracy 0.94 regarding AP). This study lays a foundation for larger-scale validation studies and clinical applications.

Results:

- ddMRI shows promise as a non-ionizing imaging modality for AP diagnosis and tooth vitality assessment
- ddMRI has the potential to provide accurate diagnostic support to clinical and radiographic examination

OP121 | CHALLENGES IN RADIOGRAPHIC DIAGNOSIS OF PRE-ERUPTIVE INTRACORONAL RESORPTION (PEIR) IN UNERUPTED PERMANENT TEETH, AND IMPLICATIONS IN TREATMENT PLANNING

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Aim: To report the occurrence and relevant radiographic features of pre-eruptive intracoronal resorption (PEIR) in unerupted permanent teeth, and discuss the implications of potential mis-diagnosis.

Methodology: Pre-eruptive intracoronal resorption (PEIR) is a rare condition characterized by a well-defined radiolucent lesion within pulpal or root dentine of unerupted teeth, as a result of dental hard tissues breakdown,due to odontoclastic activity. It is typically detected incidentally in panoramic radiographs (OPG) with a prevalence of 3% and 4% of permanent mandibular and maxillary molars respectively. The limited capacity to detect such lesions is subjected to the orientation and topography of the lesion, and should therefore extend in mesio-distal ankle only. Taking into account the limitations of OPG, including the two-dimensional object visualization and the geometric distortion, it is more prudent to use cone beam computed tomography (CBCT) for a more detailed three-dimensional characterization of the resorptive lesions. The study suggests that a new classification system may be needed in international guidelines to encompass conditions involving PEIR similar to external cervical root resorption (ECR), as both share common histological and radiographic characteristics.

Results:

- Pre-eruptive Intracoronal Resorption is a rare condition, but early and accurate diagnosis is critical in treatment planning in cases of impacted canines that may require exposure and orthodontic alignment, surgical extraction of wisdom teeth and cases of auto-transplantation of impacted wisdom teeth.
- OPG is the most frequently used imaging method for detecting PEIR, but CBCT offers better visualization.
- A new classification system may be necessary to include PEIR and ECR within international guidelines.

OP124 | EFFECT OF SODIUM HYPOCHLORITE AND ETIDRONIC ACID ON BIOFILM REMOVAL IN SIMULATED INTERNAL ROOT RESORPTION CAVITIES: INFLUENCE OF TEMPERATURE AND IRRIGATION ACTIVATION STRATEGIES

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Aim: The aim of this study was to evaluate the antimicrobial efficacy of NaOCl and NaOCl/HEDP solutions, applied with different temperatures (25°C and 37°C) and irrigation methods, passive ultrasonic activation (PUI) and conventional needle irrigation (CNI),on E. faecalis biofilm in simulated internal root resorption (IRR) cavities.

Methodology: Simulated IRR cavities were created in 76 single-rooted maxillary central incisors, which were contaminated with E. faecalis for 21 days to facilitate biofilm formation. The teeth were divided into two main experimental groups according to the applied irrigation solutions (NaOCl or NaOCl/HEDP), as well as a control group. The experimental groups were further divided into four subgroups based on different irrigation solution temperatures (25°C or 37°C) and irrigation methods (PUI or CNI) (n=8). CFU counts were determined for all teeth prior to treatment, followed by root canal preparation. After treatment, CFU counts were measured from the root canal samples, and antimicrobial activity differences between groups were compared using one-way ANOVA and Duncan's post-hoc test.

At 37°C, NaOCl/HEDP was effective regardless of the irrigation method, whereas NaOCl showed greater effectiveness when PUI was applied ($p<0.05$). Solutions used at 25°C were more effective when PUI was applied for both NaOCl and NaOCl/HEDP ($p<0.05$). Regardless of irrigation method, NaOCl/HEDP at 37°C was more effective than at 25°C ($p<0.05$). No difference was observed between NaOCl at 37°C with CNI and at 25°C with PUI ($p>0.05$).

Results: The use of solutions at higher temperatures was found to be more effective in IRR cavities. The use of NaOCl solution at 37°C may be an alternative option to PUI. However, PUI is recommended when solutions are used at 25°C.

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OP125 | EVALUATION OF ANTIMICROBIAL EFFICACY OF DIFFERENT IRRIGATION AND ACTIVATION TECHNIQUES ON INFECTED ROOT CANAL DENTIN

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Aim: The aim of this in vitro study was to investigate the antibacterial activities of different irrigation solutions on E. faecalis comparatively by activating them with different irrigation activation methods.

Methodology: One hundred caries-free, single-rooted, single-canal teeth were prepared for X4 rotary files of ProTaper Next NiTi rotary instrument system until 40.06 apical widths were obtained. Contamination with E. faecalis was provided for 21 days. After 21 days of inoculation period, the teeth were divided into 3 main groups according to different irrigation solutions (NaOCl, Dual Rinse HEDP, Chitosan, n=30) and each group was divided into 3 different subgroups according to the activation method (Standard, needle irrigation, Passive ultrasonic activation and Sonic activation, n=10). After the application of irrigation protocols, bacteria from tooth samples were collected with PBS buffer and suspended in 1.5 mL tubes.16 µL of the obtained RNA samples were taken and cDNA synthesis was performed using the Nucleogene cDNA synthesis kit. qPCR studies were performed using the synthesized cDNA samples as templates. Ct values were obtained as a result of PCR. Data were statistically analyzed using the SPSS 26.0 program using Two-Way Anova and post hoc Bonferroni tests for the evaluation of the relationships between the groups . All tested groups showed significantly higher Ct values compared to the control group. While NaOCl was observed to remove significantly more E. Feacalis from the root canals than Chitosan and DualRinse-HEDP (p=0.009), no significant difference was observed between Chitosan and DualRinse-HEDP. For DualRinse-HEDP, the activation methods did not create a significant difference (p=0.445). According to the results of this study, it was concluded that activating NaOCl and Chitosan solutions with appropriate irrigation activation systems increased the antibacterial activities of the solutions.

Results: E. faecalis, Irrigation Activation, Sodium Hypochlorite, Dual Rinse HEDP, Chitosan

OP126 | ANTIBACTERIAL AND ANTIBIOFILM EFFICACY OF LAVANDULA MAROCCANA ESSENTIAL OIL NANOEMULSION AGAINST ENTEROCOCCUS FAECALIS: AN IN VITRO AND EX VIVO STUDY

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Aim: This study aimed to evaluate the antibacterial and antibiofilm efficacy of Thymus atlanticus essential oil (EO) nanoemulsion against Enterococcus faecalis ATCC 29212 and clinical isolate in comparison to 2.5% sodium hypochlorite (NaOCl). Furthermore, it assessed the ex vivo anti-adherence properties of the nanoemulsion in combination with etidronic acid (HEDP) on semi-cylindrical root dentin fragments compared to NaOCl+HEDP.

Methodology: Endodontic failures, particularly those involving E. faecalis, present a significant challenge due to their resistance, demanding novel disinfection strategies.
This study investigated the EO-based nanoemulsion of T. atlanticus, an endimic plant from Morocco. The nanoemulsion was formulated and screened for particle size diameter, and stability using dynamic light scattering measurements. Minimum inhibitory concentration (MIC) was evaluated using microdilution assay. Biofilm inhibition and disruption were assessed using XTT staining. The ex vivo model utilized semi-cylindrical dentin fragments to evaluate the anti-adherence properties through scanning electron microscopy (SEM) and bacterial counting assay.
The results demonstrated that T. atlanticus nanoemulsion was stable and nanosized (Zavg inferior to 200 nm). The nanoemulsion exhibited significant antibacterial activity, with a MIC of 0.62 mg/mL against both strains. It significantly prevented biofilm formation by 95% and 87% and disrupted pre-formed ones by 89% and 92% of E. faecalis ATCC 29212 and clinical isolate, respectively. While NaOCl prevented biofilm formation by 95% for the reference strain and 88% for the clinical isolate and disrupted pre-formed biofilms by 76%. Furthermore, the synergistic combination of nanoemulsion and HEDP demonstrated comparable efficacy to NaOCl + HEDP, while exhibiting superior anti-adherence compared to HEDP alone.

Results: T. atlanticus nanoemulsion exhibits strong antibacterial and antibiofilm effects against E. faecalis.
Ex vivo results confirm the efficacy of the nanoemulsion on root dentin, with significant anti-adherence potential.
The combination of nanoemulsion with HEDP enhances anti-adherence efficacy.

OP127 | COMPARATIVE ANALYSIS OF INTRA-CANAL PHOTODYNAMIC THERAPY WITH DIFFERENT PHOTOSENSITIZERS ON PERIAPICAL HEALING: A RANDOMIZED CLINICAL TRIAL

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Aim: Various additional methods such as photodynamic therapy (PDT) have been used to optimize the success of root canal treatment.This study seeks to assess the impact of PDT using different photosensitizers on in vivo lesion healing.

Methodology: Seventy single canalled teeth with periapical lesions of 53 patients were included. After biomechanical preparation they were randomly divided into 4 groups as control, methylene blue, curcumin and erythrosine groups. The photosensitizers were ultrasonically activated for 1 minute after 3 minutes of pre-irradiation time (PIT). Afterwards, they were irradiated with a diode laser for 1 minute. Radiographs at baseline, 1st, 3rd, 6th, 9th and 12th months were taken. Post-operative pain was recorded according to the VAS at the 6th, 12th, 24th hours and 1st week. The lesion dimensions were measured. The results were analyzed with the One-Way Anova and post-hoc Tukey HSD tests (=0.05).
There was a significant improvement between the baseline to the 1st month and the 1st month to the 3rd month in the PDT groups, unlike the control group. When considering the average percentage changes in lesion sizes at the 12th month, the methylene blue and curcumin groups exhibited a reduction of 91%, while the erythrosine and control groups displayed a decrease of 86%.

Results: All lesions healed, but teeth treated with PDT healed faster in the first three months.
PDT is an appropriate adjunct to conventional root canal treatment.

OP129 | ENDODONTIC MANAGEMENT OF TRAUMA CASES OCCURRING AT VARIOUS TIME INTERVALS

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Aim: Trauma-induced injuries in dental tissues, alveolar bone, and soft tissues are commonly observed clinical cases worldwide. Traumatic dental injuries are the second most common type of oral injury and rank fifth among all body injuries. The aim of this presentation is to share the preferred treatment methods for different types of traumatic injuries.

Methodology: This oral presentation discusses the trauma histories, treatment approaches, and post-treatment follow-up processes of four different cases with a history of trauma. The first two cases involve two patients who experienced trauma in childhood, with anterior teeth presenting periapical lesions, and the treatment involves the MTA apical plug technique applied for apical reconstruction, along with post-treatment follow-up procedures. In the third case, the regenerative endodontic treatment procedure applied to anterior teeth that were subluxated, mobile, and non-vital after a dental trauma sustained during a fight is discussed. The fourth and final case involves a patient with a non-complicated crown fracture, complicated crown fracture, lateral luxation, and a fracture in the buccal alveolar bone due to an epileptic seizure, and the endodontic treatment procedure applied is described.

Results: Differences in Treatment Approaches: Understanding how treatment strategies vary between patients with recent trauma histories and those undergoing long-term trauma care.
Diverse Treatment Modalities: Exploring the range of treatment methods available for different types of traumatic cases, and how these methods can be tailored to individual patient needs.
Impact of Trauma Duration on Recovery: Analyzing how the length of time since trauma influences the patient's recovery process and the chosen treatment approach.
Personalized Treatment Plans: Emphasizing the importance of customizing treatment plans for patients, depending on the nature and timeline of their trauma experience.

OP130 | BLACK TEETH- CASES OF SELF-INFLICTED INJURIES

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Aim: Treating just the tooth won't help in cases of self-inflicted injuries. Adequate attention to the psychological aspect is a must for clinical success. Two cases of Comprehensive management of self-inflicted injuries in a teenager are presented here.

Methodology: A 13-year-old boy, having traumatic dental injury three years ago, presented to the outpatient department with pain in his upper front teeth. Notably, his tooth no 11and 12 had become non-vital. Examination revealed open and untemporized root canals of the non-vital tooth no 11 and 12, which were at Nolla's stage 9 of development with periapical index scores of 4 and 5 in tooth no 11 and 12 respectively. On canal irrigation, the solution turned grey, which raised suspicion. No relevant history was reported by the child and his guardian. Intriguingly, foreign bodies—lead sticks, matchstick pieces, and fingernails—were discovered during an endodontic microscope examination. Regenerative endodontic procedures (REP) were performed in both the teeth, and follow-ups at 1, 3, and 6 months showed no complications in one incisor, while the other lost coronal seal due to re-inserted wooden sticks at the 6-month mark, requiring re-treatment. The patient was referred to the Department of Psychiatry for addressing the root cause. Follow-up at 12 and 18 months confirmed clinical and radiographic outcomes of successful REP.
In Second case, a teen had inserted a pen nib, and stapler pins into his permanent mature maxillary right central incisor. Root canal treatment was done post-retrieval under Dental Operating microscope.

Results:
• Identifying and addressing dental self-inflicted injuries is essential for maintaining oral health, preventing complications, managing pain, ensuring proper oral function, promoting psychological well-being and achieving long-term cost savings.

• The adept management of the case was seamless, facilitated by the invaluable assistance rendered by the endodontic microscope.

OP132 | EPIDEMIOLOGICAL STUDY OF WORK-RELATED TRAUMATIC DENTAL INJURIES IN AN ADULT SPANISH POPULATION

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AIM: Traumatic dental injuries (TDI) present a significant prevalence across all age groups. Effective management is crucial to ensure accurate diagnosis and adequate treatment. This study aims to analyze the prevalence of dental trauma through the assessment of epidemiological factors such as seasonal trends, causes, injury types, and case follow-ups. Secondary objectives included highlighting its medical and social impact and evaluating adherence to International Association of Dental Traumatology (IADT) guidelines.

Methodology: After ethical approval, a total of 193 healthy patients (>18 years) from a private dental clinic were included in the study after assessment for eligibility. The study evaluated multiple parameters, including diagnostic findings, treatment strategies, follow-ups and case resolution. A descriptive statistical analysis was performed to evaluate the results.

Results: A total of 333 teeth were evaluated. The highest incidence of TDI was observed in June, predominantly affecting individuals aged 18-40 years (49.72%), with a male predominance (72.07%). Work-related accidents were the leading cause (67.80%), and uncomplicated crown fractures (enamel-dentin) were the most common diagnosed injury (35.42%). Predominantly the time between the trauma and the visit was less than 7 days (74.72%). The preferred splinting technique was a flexible wire splint (11.94%) with a stabilization period of 4 weeks in 40.74% of cases. Follow-ups were conducted in 34% of cases, with radiographic evaluations in 11% of these cases.

Conclusions: Diagnosis approach, treatment planning, and overall case management were influenced by multiple variables. Early and appropriate intervention improved the prognosis and long-term survival of traumatized teeth. Increasing awareness and education among both healthcare providers and the general population is crucial to improve dental trauma outcomes. Adherence to the IADT guidelines, together with targeted educational initiatives, could lead to improved treatment efficacy and a higher rate of tooth preservation when compared to cases treated without compliance with the guidelines.

OP133 | ENDODONTIC SEQUELAE ASSOCIATED WITH REPETITIVE IMPACTS TO THE DENTOFACIAL REGION DURING BOXING ACTIVITIES

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Aim: To explore self-reported dentofacial trauma and their potential endodontic sequelae in boxers using a questionnaire, followed by clinical and radiographic assessment to (1) compare the nature and number of self-reported dentofacial injuries with physical evidence of injury sequelae; and (2) investigate potential risk factors influencing dentofacial trauma and their endodontic sequelae.

Methodology: Methodology: A focus group validated questionnaire was completed by 176 boxers recruited from 16 London boxing clubs; 61 boxers from this cohort then attended a London dental hospital, for a clinical and radiographic assessment. Data from the questionnaire and clinical assessments were then collated and analysed using Chi-squared or t-tests.

Results: Questionnaire data revealed 87.5% of boxers reported a history of dentofacial trauma during boxing activity. The clinical and radiographic assessment detected evidence of dentofacial trauma in 91.8% of boxers and dental injury or endodontic-related injury sequelae in 68.9% of boxers. There was a significant association between dentofacial trauma and boxers who did not participate in weekly neck weight sessions ($p < .001$), and there was a significant association between trauma-related endodontic sequelae and: boxer age ($p = .01$); competitions per month ($p = .002$); and defensive skill ($p = .007$).
Results: A majority of the cohort had suffered dentofacial injuries and endodontic sequelae. The questionnaire data under-reported musculoskeletal injuries and endodontic sequelae, suggesting that some hard-tissue injuries following repetitive dentofacial trauma may have a subclinical presentation. Injury risk may be related to increased boxer age, defensive skills, frequency of participation in competitions, and frequency of neck weight sessions per week.

OP134 | A MICRO-CT EXAMINATION AND 3D PRINTING OF THE PULP STONES STRUCTURE IN THE CORRELATION OF THE PATIENT'S GENERAL HEALTH STATUS

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Aim: Pulp stones are hard tissue structures formed in the pulp of permanent and deciduous teeth. Their formation, composition, configuration play a role in a clinical workflow of an endodontic therapy increasing the risk of errors. There's still missing data about the correlation of their occurrence and the general health status of the patient. The aim of the presentation is the visualization of the structure of the pulp stones and the discussion, if there is any correlation in between the pattern of mineralization, their shape and form in terms of health issues of the patients. Materials and Methods: 33 nodules were collected from teeth undergoing endodontic treatment of 18 female and 15 male patients at the age ranging from 22 to 60. The Micro CT-scans were performed with the SMX-90 CT device and Inspexio (Shimadzu Corp., Kyoto, Japan) and VG Studio 3.5 software (Volume Graphics, Heidelberg, Germany). Data about the general health status were collected.

Results: Variety of the pulp stone forms has been evaluated. They differed considerably in shape, size and topography. The site of the stones in the pulp space was the factor that most affected the morphology. Nodular morphology as well as a diffuse shape was revealed depend on the site of their origin. The topography of the nodules showed both smooth and compact areas, contrasting with the rugged and porous, heterogeneous relief.
Results: Conclusions: The high cellularity rate of the coronal pulp predisposes this region to nodular mineralizations around injured cells.. Analysis of the systemic health status of the patients seems not to confirm a clear correlation of the pulp stones occurrence. There is a need of further studies which may help to understand the morphology and pathways of the nodules formation in terms of prevention of denticles development and endodontic treatment ease.

OP135 | ANALYSIS OF IMPACTED TEETH HAVING ROOT RESORPTION

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Aim: Analysis of structural and histologic characteristics of impacted teeth with root resorption.

Methodology: In this multidisciplinary study we present two indicative cases with impacted teeth having resoprtion. After extraction, we assessed the internal and external tooth structure with a high performance NanoTom scanner (GE Measurement and Control Solutions, Wunstorf, Germany), which provided accurate images with a resolution of 7 micro-meter. 3D modelling was done by using the CTAn, CTvol CTvox and DataViewer softwares (Bruker micro-CT, Kontich, Belgium). The cellular structure was evaluated with hard tissue histology (PMME sections).

We have observed that, the characteristics of impacted teeth resemble those of External Cervical Resorption (ECR), as a characteristic ‘resistant’ pericanalar layer was visible around the vital pulp space and resorption tissue, reparative bone-like tissue along with resorption channels existed.
This suggests that external cervical resorption can occur in impacted teeth. Despite the fact that the propagation mechanism appears similar as in fully erupted teeth the etiology may be considerably different.

Results:
• Describe resorption characteristics in impacted teeth
• ECR can occur in impacted teeth
• Link mechanism to etiology

OP136 | ENDODONTIC MEDICINE; BIDIRECTIONAL ASSOCIATION OF PERIODONTITIS AND APICAL PERIODONTISTS WITH SYSTEMIC NONCOMMUNICABLE DISEASES

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Aim: To investigate the possible bidirectional relationship between apical periodontitis (AP) and non-communicable diseases (NCDs), as well as to examine evidence regarding medications associated with the incidence, prevalence, or healing of endodontic diseases.

Methodology: Apical periodontitis (AP) is a chronic inflammatory disease driven by the immune system's response to polymicrobial infections. While localized, these conditions elevate cytokine levels, potentially contributing to systemic inflammation and impacting overall health. This presentation will explore the potential bidirectional relationship between AP and non-communicable diseases (NCDs), a leading cause of global mortality. The presentation leverages our published research to explore the connection between AP and specific NCDs. Previous works examined the potential mechanism linking diabetes to apical periodontitis by examining bacterial quantity and IL-17 levels in necrotic teeth. In addition, the presentation will explore the evidence from some medications linked with the incidence, prevalence, or healing of endodontic diseases. Recognizing the interconnectedness of AP and systemic health is essential. Thus, we can contribute to improved overall health outcomes.

Results:

1. At conclusion, participants should be able to define non-communicable diseases and discuss if apical periodontitis is considered NCDs.

2. At conclusion, participants should be able to discuss current evidence of the bidirectional relationship between apical periodontists and diabetes , including drug usage.

OP137 | SCREENING OF MOLECULAR BIOMARKERS TO DISTINGUISH DIFFERENT EXTENT OF PULPITIS

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Aim: This study was conducted to quantitatively assess the color characteristics and levels of inflammatory factors in blood collected from the pulp exposure in order to screen the potential objective indicators to distinguish different extent of pulpitis.

Methodology: Diagnostic accuracy of pulpitis is a critical prognostic factor of vital pulp therapy (VPT). It is an urgent problem in the diagnosis and treatment of pulpal disease to find clinically available objective indicators to distinguish the degree of pulpitis. This cross-sectional study was conducted to investigate the correlation between color characteristics of pulp blood and target molecular biomarker levels in pulp blood and pulp inflammation degree. We found that pulp blood could be used as the detection sample for pulpitis diagnosis.The L* value showed moderate diagnostic accuracy for distinguishing between normal pulp(NP) and irreversible pulpitis(IRP) and between reversible pulpitis(RP) and IRP. The levels of MMP-9, IL-1 β and IL-8 in pulp blood were significantly higher in RP and IRP compared to NP.

Results: Color characteristics and molecular biomarkers of pulp blood were potentially objective indicators for assessment of pulp inflammation extent, further laying a basis for the selection of VPT methods.

OP138 | A CAUSAL MECHANISM THROUGH WHICH PORPHYROMONAS GINGIVALIS INDUCED GLUCOSE INTOLERANCE DURING PERIAPICAL LESIONS REQUIRES A TH17 IMMUNE RESPONSE

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Aim: To explore the role of Interleukin 17 (IL-17) in the exacerbation of Porphyromonas gingivalis (Pg)-induced periapical lesions in the context of metabolic disease, and to assess its impact on systemic glucose metabolism.

Methodology: Periapical lesions are common consequences of bacterial infection in endodontics, but their systemic implications remain underexplored. This study introduces a novel mouse model to investigate the interaction between Pg-induced periapical lesions and metabolic disease, focusing on the immunological role of IL-17.

Mice were monocolonized orally with Pg to induce periapical lesions. After one month, animals were fed a high-fat diet (HFD) for two months to simulate a state of metabolic dysfunction and oral dysbiosis. Both wild-type (WT) and IL-17 knockout (KO) mice were challenged with either LPS-depleted or non-depleted Pg strains. The study evaluated bone resorption, immune cell infiltration, glucose tolerance, and adipose tissue inflammation.

Results showed that in WT mice, Pg-LPS significantly aggravated bone lysis, Th17 cell recruitment, and periapical damage. In contrast, IL-17 KO mice exhibited reduced periapical bone loss and systemic glucose intolerance, alongside lower inflammatory markers in adipose tissue—despite the persistence of dysbiosis. These findings highlight the pivotal role of IL-17 in linking local oral inflammation to systemic metabolic consequences.

Results:
- IL-17 is a key amplifier of Pg-induced periapical lesions and systemic inflammation.
- Periapical infection can exacerbate glucose intolerance in the context of metabolic disease.
- IL-17 deficiency mitigates both local bone loss and systemic metabolic disruption.
- The presence of P. gingivalis lipopolysaccharides (LPS) exacerbates periapical bone resorption and immune cell recruitment.
- Targeting IL-17 pathways may represent a novel therapeutic strategy to reduce type 2 diabetes risk in patients with periapical pathology.

OP139 | THE CXCR2/LIGANDS AXIS: A HIDDEN REGULATOR OF PULPITIS

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Aim: This presentation aims to highlight the findings of an innovative fundamental research study that explores uncharted aspects of pulp-dentin biology. This is the first study that provides preliminary insights into the CXCR2/ligands axis during pulpitis, introducing a novel research avenue in pulp-dentin biology that could significantly enhance our understanding of inflammatory balance regulation in pulpitis.

Methodology: This work presents a novel rat model of progressive and controlled LPS-induced pulpitis which allows to examine, for the first time, the interplay between the CXCR2/ligand axis, neutrophil recruitment, and pulpitis progression. Using histological, immunohistochemical (myeloperoxidase, CXCL1, CXCL2), and gene expression (IL-6, MMP-9, CXCL1) analyses, we aimed to correlate inflammation dynamics with CXCR2/ligands axis activation. The results show that neutrophil recruitment and activity, indicated by myeloperoxidase expression, were closely linked to tissue damage. Notably, CXCL1 and CXCL2 displayed distinct expression patterns, suggesting different roles in the inflammatory response: CXCL1 appeared to be associated with neutrophil activity and tissue degradation, whereas the delayed, inconsistent, and localized expression of CXCL2 implied a role in fine-tuning the inflammatory process. This study is the first to provide preliminary insights into the CXCR2/ligand axis in pulpitis, opening a novel avenue of research in pulp-dentin biology. Understanding this axis could significantly refine our perception of inflammatory regulation in pulpitis and pave the way for targeted therapeutic strategies.

Results:
- The activity of neutrophils —both in intensity and duration—can decisively influence the progression of the inflammatory response
- As a key regulator of neutrophil physiology, the CXCR2/ligands axis plays a crucial role in the inflammatory process
- During pulpitis, neutrophil recruitment and activity are closely linked to tissue damage
- CXCL1 and CXCL2 display two different expression patterns, indicating distinct roles during pulpitis

OP140 | ULTRASONOGRAPHIC ASSESSMENT OF PRF AND DEHYDRATED HUMAN-DERIVED MEMBRANE IN PERIAPICAL BONE REGENERATION: A RANDOMIZED CONTROLLED TRIAL

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Aim: To assess the reduction in the size of the periapical defect following endodontic surgery using a bioactive resorbable membrane.

Methodology: Endodontic surgery is a last-resort approach for managing periapical or peri-radicular lesions when orthograde endodontic treatment is ineffective or poses risks. Healing outcomes depend on factors such as wound characteristics, stem cells, growth factors, and the surgical site's microenvironment. Regenerative techniques, including barrier membranes, bone grafting, PRF, and PRP, aid in restoring bone, cementum, and the periodontal ligament by promoting true tissue regeneration.

Ultrasound and color Doppler imaging offer non-invasive, reproducible alternatives to conventional radiography for diagnosing and monitoring periapical lesions. These techniques provide precise lesion size assessment while minimizing radiation exposure. Additionally, color Doppler imaging helps evaluate blood flow dynamics and early neovascularization in bone healing.
Treatment Protocol & Findings
Patients were selected between the age group of 18–40 years with periapical lesions >8mm with no systemic illness . After consent, they were randomly assigned into three groups using SNOSE: Group A (Hydroxyapatite), Group B (PRF), and Group C (Chorion). Preoperative ultrasound and color Doppler imaging assessed lesion size and peak systolic velocity. Periapical surgery was performed using the respective materials, with postoperative evaluations at 1 and 6 months with ultrasound and color doppler.

Follow-Up & Conclusion
The Chorion group showed the greatest lesion size reduction and peak systolic velocity, indicating enhanced neoangiogenesis. Thus it was concluded that Human biological membranes which is rich in growth factors like EGF, bFGF(basic fibroblast growth factor), KGF, and VEGF, acted as effective bio-conductive and bio-inductive barriers, accelerating bone regeneration in periapical defects

Results:
- Human Biologic membrane are abundant in growth factors which promotes neoangiogenesis.
- Ultrasound and color doppler are noninvasive method of assessing bone healing.

OP141 | IMPACT OF DIFFERENT EDTA IRRIGATION ACTIVATION TECHNIQUES ON DENTIN AND BLOOD CLOT SURFACE ROUGHNESS IN REGENERATIVE ENDODONTICS: A 3D CLSM ANALYSIS

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Aim: This study aims to evaluate the effect of ethylenediaminetetraacetic acid (EDTA) irrigation using different activation techniques—standard needle irrigation (SNI), passive ultrasonic irrigation (PUI), EDDY, and SWEEPS (Shock Wave Enhanced Emission Photoacoustic Streaming)—on the surface roughness of dentin and blood clots in regenerative endodontic treatment (RET), analyzed with 3D confocal laser scanning microscopy (CLSM). By assessing how these activation methods influence dentin and blood clot modification, the study seeks to provide insights into optimizing RET protocols for enhanced regenerative outcomes.

Methodology: Seventy-five extracted single-rooted teeth were standardized to simulate immature apices and divided into five groups: SNI, PUI, EDDY, SWEEPS and a saline control group, with 15 teeth each. EDTA activation was applied to the experimental groups, followed by dentin surface roughness measurement in arithmetical mean height (Sa) values, which assess surface roughness in three dimensions. A blood clot was then introduced to evaluate blood clot surface roughness. Statistical analysis revealed significant differences among activation methods. The control group had the lowest dentin roughness, while PUI and EDDY showed the highest, especially in the apical and middle regions. SWEEPS had intermediate values, and SNI was lower than PUI and EDDY. After blood clot application, roughness increased in the control group but decreased in all others, with the largest drop in PUI and EDDY, particularly in the middle and apical regions. SNI and SWEEPS showed moderate reductions.

Results:

- EDTA activation influences dentin roughness and blood clot interaction, affecting RET success.
- Irrigation activation methods impact dentin properties and blood clot stability.
- Optimizing EDTA activation supports cellular attachment and regeneration.
- Further research is needed to identify the best activation strategy for RET.

OP142 | DISCOLORATION EFFECT OF TRIPLE ANTIBIOTIC PASTE PREPARED WITH NITROFURANTOIN

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Aim: Antibiotic pastes used in regenerative endodontics can cause discoloration of teeth. Nitrofurantioin, an antibiotic that has been studied as an intracanal medicament for regenerative endodontics recently, was claimed to be effective in terms of antibacterial efficacy. This study aims to investigate the effect of a newly used modified triple antibiotic paste containing nitrofurantoin (TAPn) on discoloration by comparing with triple antibiotic paste with doxycycline (TAPd) and double antibiotic paste (DAP).

Methodology: After the endodontic access cavity preparation of 39 extracted maxillar human central incisors, the root canals were prepared upto #6 peeso-reamer drills to simulate immature teeth. The specimens were randomly divided into three groups (n=13), each receiving one of the three antibiotic paste fillings: (1) triple antibiotic paste with doxycycline (TAPd; mix of ciprofloxacin, metronidazole and doxycycline, 1:1:1) (2) double antibiotic paste (DAP; mix of ciprofloxacin and metronidazole, 1:1:1), (3) TAP with nitrofurantoin (TAPn; mix of ciprofloxacin, metronidazole and nitrofurantoin, 1:1:1). Color change measurements were performed using a spectrophotometer device (VITA Easyshade Compact 5.0). Spectrophotometric measurements were obtained at baseline and then during the first, second, and third weeks after paste placement. The δE values were calculated and analyzed using a two-way analysis of variance with post-hoc Tukey's test (α= 0.05).
Statistically significant coronal discoloration was observed over time in all three groups ($p<0.05$). The most discoloration was observed in the 3rd week ($p<0.05$), while the lowest change was observed in the 1st week ($p<0.05$). TAPn exhibited statistically significantly greater discoloration compared to DAP ($p<0.05$), and TAPd ($p<0.05$). The statistical analysis revealed no statistically significant difference between DAP and TAPd ($p>0.05$).

Results: The discoloration degree increased over time. TAPn paste caused higher discoloration than TAPd and DAP pastes.

OP143 | INTEGRATION OF PLATELET-RICH FIBRIN IN TISSUE ENGINEERING: EVIDENCE-BASED INNOVATIONS AND DECISION-MAKING IN REGENERATIVE ENDODONTICS

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Aim: The aim of this presentation is to evaluate the efficacy of PRF in regenerative endodontics, to highlight recent innovations in its application and to propose evidence-based decision-making frameworks for its integration into clinical practice.

Methodology: PRF has emerged as a pivotal autologous biomaterial in regenerative endodontics, offering a biologically active scaffold that enhances healing and tissue regeneration. Rich in growth factors, it promotes angiogenesis, modulates inflammation and facilitates extracellular matrix formation. Despite its potential, the absence of standardized protocols and clear clinical guidelines poses challenges for consistent application.
Methodology:A comprehensive review of current literature was conducted, focusing on PRF's role in apexogenesis, vital pulp therapy, and periapical healing. The analysis encompassed preparation techniques, biological mechanisms, and clinical outcomes. Insights from expert consensus and case studies were utilized to develop practical guidelines for clinicians.

Results: PRF's bioactive matrix serves as a reservoir for growth factors and immune mediators, enhancing tissue healing through cellular proliferation, angiogenesis, and modulation of inflammatory responses. Clinical studies demonstrate improved outcomes in maintaining pulp vitality and promoting periapical healing : Innovations in PRF preparation(optimized centrifugation protocols and combination with other biomaterials) have enhanced its therapeutic potential. A decision-making framework is presented, detailing patient selection criteria, preparation protocols, and treatment pathways for effective clinical application.
Conclusion: PRF is a significant advancement in regenerative endodontics, bridging the gap between biological innovation and clinical application.By adhering to evidence-based guidelines and utilizing structured decision-making frameworks, clinicians can effectively incorporate PRF into practice, leading to improved patient outcomes.Future research should focus on standardizing protocols and exploring synergistic effects with emerging regenerative technologies.

Results:

•Understanding the biological mechanisms by which PRF enhances tissue regeneration in endodontics.

•Implementing evidence-based strategies for the clinical integration of PRF.

•Exploring innovations in PRF preparation and application to optimize therapeutic outcomes.

OP144 | EXPLORING THE USE OF HUMAN EPITHELIAL TOOTH ORGANOIDS TO STUDY THE AETIOLOGY OF MOLAR INCISOR HYPOMINERALISATION

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Aim: This research aims to establish and examine epithelial tooth organoids (ETO) from MIH-affected teeth to explore the impact of known MIH-related factors, such as bisphenol A (BPA) and amoxicillin, on amelogenesis.

Methodology: Teeth are vital for our overall health and well-being. While several dental conditions are well documented, molar incisor hypomineralisation (MIH) remains poorly understood. MIH is a complex enamel disorder associated with enamel mineralisation defects, leading to increased sensitivity, susceptibility to decay, and tooth loss. Understanding the underlying factors of MIH is essential for effective prevention and treatment strategies. Yet, research remains limited due to the complex mechanics behind enamel development and the lack of suitable in vitro models. This study explores the use of 3D organoid models derived from human dental follicle (DF) tissue, recently developed by our group to study tooth embryology and the aetiology of MIH. Our research is aimed at establishing epithelial tooth organoids (ETO) from MIH-affected teeth and investigating the effects of known MIH aetiological factors, such as bisphenol A (BPA) and amoxicillin, on amelogenesis. Our results demonstrate the successful establishment of ETO from MIH-affected teeth and provide some first insights into the impact of BPA and amoxicillin on enamel development. This study highlights the application of 3D organoid models in researching enamel development and associated dental diseases like MIH and further lays the foundations for further research within this field.

Results:

- Molar incisor hypomineralisation (MIH) is a complex enamel disorder that causes sensitivity, decay, and tooth loss.
- 3D organoid models from human dental follicle tissue offer a new method to study MIH and enamel development.

The study explores the effects of bisphenol A (BPA) and amoxicillin on amelogenesis in MIH-affected teeth.

OP145 | SLIT3: A NOVEL REGULATOR OF ODONTOGENIC DIFFERENTIATION THROUGH AKT/WNT/BETA-CATENIN SIGNALING PATHWAY

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Aim: In recent years, it has been found that SLIT3, a classical axon guidance molecule, can link bone resorption to formation as clastokine. However, there is little information about SLIT3 in odontogenesis. Stem cells from apical papilla (SCAP) play an essential role in the development of tooth. This study is aimed to explore the effects and possible mechanism of SLIT3 on the proliferation and differentiation of SCAP.

Methodology: Immunohistochemical staining and re-analysis of single-cell RNA sequencing and microarray datasets were employed to evaluate the in vivo expression of SLIT3. The expression of SLIT3 in vitro were assess by RT-PCR and Western blot. Cell viability was analyzed by Cell Counting Kit-8 assays (CCK8). SLIT3 siRNA was used to knockdown SLIT3 and recombinant human SLIT3 (rhSLIT3) protein was used to treat SCAP. Alkaline phosphatase (ALP) staining and Alizarin red staining were used to assess the potential for odontogenic differentiation of SCAP. DMP-1 and DSPP were assessed by RT-PCR and Western blot as odontogenic differentiation markers. RT-PCR, Western blot and immunofluorescence were used to study the involvement of Akt/Wnt/beta-catenin signaling pathway.SLIT3 was expressed in the dental papilla and odontoblast layer of the developing molar tooth of mice. RT-PCR and Western blot assays revealed an increased expression of SLIT3 during the odontogenic differentiation of SCAP. CCK8 assays showed SLIT3 promoted proliferation of SCAP. After knockdown of SLIT3 in SCAP, ALP staining and Alizarin red staining were decreased/increased accordingly. Odontogenic markers DMP-1 and DSPP were also down-regulated/up-regulated. In addition, p-Akt and p-GSK3beta levels were increased in rhSLIT3-treated SCAP and the movement into cell nucleus of beta-catenin was promoted. The effect of SLIT3 on the odontogenic differentiation of SCAP was canceled after treatment with inhibitors.

Results: Our study found that SLIT3 could promote the proliferation and odontogenic differentiation of SCAP by activating Akt/Wnt/beta-catenin signaling pathway.

OP146 | POSTENDODONTIC RESTAURATION WITH GLASS-FIBER-FLOW (FRCI)

K. RIESS

Zahnarztpraxis Wiedemann, Zusmarshausen, GERMANY

Aim: Endodontists aim for excellence in root canal treatment, including filling and sealing the root canal system. However, a well-fitted definitive restoration is equally critical for long-term success, ideally without leakage and no more loss of tooth structure occurring for years.

Methodology: Endodontists aim for excellence in root canal treatment, including filling and sealing the root canal system. However, a well-fitted definitive restoration is equally critical for long-term success, ideally without leakage occurring for years. Often endodontists may only place a shallow composite layer into the canal orifices and the pulp floor, with the remainder of the restoration carried out by a general dentist. . Would the long-term success increase if endodontists placed the entire adhesive build-up immediately after completion of the endodontic treatment? Studies have shown that posts are only needed if a build-up lacks enough retention. Also, many novel build-up materials, including light-curing, self-curing, or dual-curing composites, are continuously becoming available. The lecture will give a detailed protocol on how to build-up of a tooth with light-curing glass-fiber-flow after endodontic treatment supported by clinical cases. The workflow and the composite selection will critically discused referring to the literature.

Results: Participants will be able to execute a step-by-step workflow of post-endodontic adhesive build-up with light-curing composite and will receive the interim results of a long-term study after 24 months, which is planned to last a total of five years.

OP147 | THE INFLUENCE OF POST-CORE BUILD-UP ON FRACTURE RESISTANCE OF CROWNED INCISORS SUBMITTED TO STATIC LOADING

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Aim: To explore the mechanical behavior of different core build-up designs in root canal treated anterior teeth with little remaining tooth substance, though with ferrule, restored with ceramic crowns.

Methodology: This presentation focuses on the question whether we can truly eliminate the use of fiber posts in extensively damaged root filled incisors by using short fiber reinforced composites without posts. Therefore, the load bearing capacity of different core build-ups with bonded indirect restoration was evaluated.
Eighty bovine incisors with similar dimensions and dentine wall thickness were decoronated and endodontically treated, leaving 6mm post space. They were randomly divided into 4 groups (n=20), according to the type of build-up material: DC CORE Plus with D.T. Light post, EverX flowable, EverX posterior, or conventional flowable composite (Clearfill Majesty ES Flow). Initial LiSi Blocks were used for the CAD/CAM designed indirect restorations which were adhesively cemented.
After thermocycling, static loading was applied at 0.5mm/min until fracture. Mean fracture loads were compared across groups using ANOVA. Fracture type was determined using a stereomicroscope.
The mean load of the Ever X flowable outcompeted the post group and the flowable group. The Ever X posterior group, and the post group had a significantly higher mean load as compared to the flowable group. No other statistically significant differences in fracture load between the different core build-ups were found.
No significant differences in distribution of fracture type were observed between the groups. The lecture will discuss this setup, the results and possible implications in the day-to-day practice.

Results:
- To understand the importance of an adequate restoration on the longevity of endodontically treated incisors
- To identify an alternative build-up material hence the development of new materials
- To be aware of different material characteristics and their indications and shortcomings

OP148 | ONE-YEAR CLINICAL EVALUATION OF POLYETHYLENE FIBER-REINFORCED COMPOSITE RESTORATIONS IN ENDODONTICALLY TREATED POSTERIOR TEETH

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Aim: This study evaluated the 1-year clinical performance of direct composite restorations by placing Ribbond in different orientations in endodontically treated posterior teeth.

Methodology: This clinical study was approved by the Selçuk University Faculty of Dentistry Ethics Committee (Approval No: 2023/54). Eighty-five patients (59 females, 26 males) between 18 and 50, requiring restorations of 90 endodontically treated posterior teeth, were included. Clearfil SE Bond adhesive system, G-aenial Universal Injectable, G-aenial A'chord composites, and Ribbond (polyethylene fiber) were used. Ribbond was placed in different orientations according to the remaining tooth structure. The restorations were divided into three groups:

- Group 1: Ribbond was placed in a circular orientation to cover the pulpal floor.
- Group 2: Ribbond was placed in an "I" shape in the mesiodistal direction on the pulpal wall.
- Group 3: Ribbond was placed in an "I" shape in the buccolingual direction on the pulpal wall.

All restorations were evaluated according to modified USPHS criteria at the 1st week, 6th month, and 1-year follow-up. Statistical analysis was performed using Chi-square and Cochran Q tests ($p < 0.05$).

Results: No significant changes time-dependent were observed within any group for the evaluated criteria. Additionally, there were no statistically significant differences among the three groups in any of the modified USPHS criteria ($p > 0.05$).

Conclusion: At the end of one year, endodontically treated posterior teeth restored with ribbond-reinforced composites placed in different orientations demonstrated successful clinical performance. However, the orientation of the fiber did not significantly affect the success of the restorations.
Key words: Ribbond-reinforced composite, endodontically treated posterior teeth, modified USPHS, different ribbond placement.

OP149 | 3D PRINTING DEFINITIVE CUSPAL COVERAGE RESTORATIONS FOR ENDODONTICALLY TREATED TEETH

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Aim: This presentation explores the role of 3D printing in the fabrication of definitive cuspal coverage restorations for endodontically treated teeth. It will highlight the advantages, challenges, and specific case studies where indirect restorations were 3D printed, while addressing the current lack of evidence in the literature.

Methodology: Traditionally, endodontically treated posterior teeth restored with cuspal coverage restorations have been shown to have improved survival rates. Historically, indirect restorations such as crowns or onlays have been fabricated using conventional laboratory technique, such as the lost wax technique, with CAD/CAM milling emerging as a popular digital alternative over the last few decades. However, 3D printing offers several advantages over milling, including reduced material waste, lower production costs and increased design flexibility.

The 3D printed definitive restorations are fabricated using a material composed of a combination of resin and ceramic. This hybrid composition aims to balance strength, aesthetics and adaptability, but its long-term clinical performance remains largely unstudied. Unlike well-established milled ceramic materials, there is currently little high-quality evidence evaluating the mechanical properties, wear resistance, and longevity of 3D-printed resin-ceramic restorations.

To address this gap, a randomised controlled trial is currently underway comparing the clinical performance of 3D-printed resin-ceramic restorations with milled lithium disilicate restorations in endodontically treated teeth. This study will assess key parameters such as survival rates, marginal adaptation over time using the United States Public Health Service (USPHS) Criteria. Initial clinical insights from the trial will be discussed, providing valuable information on the viability of 3D printing as a mainstream restorative option.

Results:

- Understand the digital workflow of 3D-printed restorations.
- Explore the advantages of 3D printing over milling.
- Recognise the lack of clinical studies on 3D-printed restorations and the need for further research.
- Gain insights from an ongoing randomised controlled trial comparing 3D-printed restorations with milled lithium disilicate.

OP150 | MATERIAL COMPOSITION, THICKNESS, AND MECHANICAL COMPATIBILITY WITH UNDERLYING TOOTH STRUCTURE SIGNIFICANTLY INFLUENCE THE FRACTURE RESISTANCE OF CAD/CAM RESTORATIVE MATERIALS

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Aim: To evaluate how material thickness, composition, flexural strength, and the modulus of elasticity compatibility between the restoration and dentine influence the fracture resistance of restorative materials.

Methodology: CAD/CAM restorations are widely favoured for their durability, biocompatibility, and aesthetics. Glass matrix ceramics like IPS e.max CAD (Ivoclar Vivadent, Liechtenstein) are well-established but brittle, whereas nanoceramics and hybrid ceramics provide improved stress distribution and repairability but may suffer from debonding or catastrophic failure. Recently, 3D-printed materials such as Permanent Crown Resin (Formlabs, USA) have emerged as cost-effective alternatives, though their mechanical properties remain underexplored. Many existing studies fail to isolate material thickness as a variable, making it difficult to determine its direct effect on fracture resistance.
This study evaluated four restorative materials—Vita Enamic (VITA Zahnfabrik, Germany), IPS e.max CAD, Brilliant Crios (Coltene, Switzerland), and Permanent Crown Resin, at thicknesses of 0.5, 1, 1.5, and 2 mm. The materials were tested both as standalone samples and when bonded to bovine dentine. Fracture resistance was measured using a universal testing machine, while flexural strength and elastic modulus were assessed through three-point bending tests (ISO Standard 6872:2018). Micro-CT imaging was used to analyse fracture patterns.

Results:

• Increasing material thickness enhances fracture resistance, with material selection also playing a critical role.

• A closer match in elastic modulus between the restoration and dentine improves fracture resistance, whereas a significant mismatch increases the risk of debonding and mechanical failure.

• Micro-CT analysis revealed that IPS e.max CAD was the only material to exhibit both adhesive failure at the cement interface and substrate failure.

• Permanent Crown Resin showed notable surface deformation, which may have contributed to its improved failure load performance.

OP153 | INFLUENCE OF ROOT CANAL TAPER ON ISTHMUS CLEANING BY TWO TYPES OF ULTRASONICALLY (IRRISAFE AND SMARTLITE PRO ENDOACTIVATOR) AND LASER-ACTIVATED IRRIGATION (SSP AND SWEEPS)

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Aim: To evaluate the influence of root canal taper (4% versus 6%) on the removal of a biofilm-mimicking hydrogel from an isthmus in root canal models with two types of ultrasonically (UAI) and laser-activated irrigation (LAI); and longer activation time (5 x 30 s).

Methodology: Two types of transparent polymethylmethacrylate blocks containing two standardized root canals (4% or 6% taper, apical diameter 0.3 mm, 16 mm long, with a coronal reservoir) connected by an isthmus (0.15 mm wide, 2 mm heightand 3 mm length) were used. The isthmus was filled with an artificial biofilm according to Swimberghe et al.(2019). The models were randomly assigned to four activation groups (n = 20): (1) SmartLite Pro EndoActivator UAI, (2) UAI with an Irrisafe and (3-4) LAI with a 2940 nm Er:YAG-laser (SSP - conical tip, and SWEEPS-flat tip - both in the pulp chamber). All protocols were executed for 5 × 30 s. Needle irrigation with a 27G needle served as the control.
Standardized images of the isthmus were taken before and after irrigationwith a digital single-lens reflex camera (Nikon D300, Tokyo, Japan) with a 120mm macro lens (Medical Nikkor (1/1), f=4). The amount of removed hydrogel was determined using image analysis software and compared across groups using Welch and corresponding Games-Howell post hoc testsanova ($P < 0.05$).Comparisons between initial and final values revealed significant differences for all groups (paired samples t-test, $P < 0.05$).

Results:
• Needle irrigation, Irrisafe and SmartLite Pro have significant lower isthmus cleanliness in comparison with SSP (PIPS) and SWEEPS LAI for both tapers.

• Comparisons of the isthmus' cleanliness between tapers 4% and 6% did not show any significant differences for none of the individual groups (independent samples t-test, $P > 0.05$).

• The impact of taper is not decisive at longer irrigation times for the individual groups

OP154 | A NOVEL APPROACH IN ENDODONTIC IRRIGATION: SUBMICRON DIAMONDS FOR ENHANCED CLEANING AND SEALER PENETRATION

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Aim: This presentation explores the benefits of incorporating submicron diamonds into endodontic irrigation solutions, focusing on their impact on smear layer and biofilm removal, debris elimination, and bioceramic sealer penetration.

Methodology: Submicron diamonds of varying sizes were added to endodontic irrigation solutions, with optimal particle size and concentration determined through preliminary trials. Their effectiveness in removing the smear layer, hard tissue debris, and Enterococcus faecalis (E. faecalis) biofilm, as well as enhancing bioceramic sealer penetration into dentin tubules, was evaluated in endodontically prepared premolars and the mesial-buccal roots of mandibular first molars. Cytotoxicity and antimicrobial efficacy were also assessed.

The study found that 500 nm submicron diamonds in sodium hypochlorite (NaOCl) with sonic agitation significantly improved smear layer removal, as confirmed by scanning electron microscopy. Microcomputed tomography analysis showed that this enhanced irrigant was as effective as ethylenediaminetetraacetic acid (EDTA) in removing hard tissue debris. Confocal laser scanning microscopy (CLSM) demonstrated superior biofilm removal, particularly in the middle and apical regions, compared to other groups.

Additionally, CLSM revealed that sealer penetration percentage in the 500 nm submicron diamond group was comparable to EDTA, with greater penetration depth observed. The 500 nm submicron diamond solution was non-toxic at low concentrations, demonstrating biocompatibility with NIH/3T3 fibroblasts and exhibiting antibacterial activity against Streptococcus mutans (S. mutans), though not against E. faecalis in time-kill assays.

Results: Objective: Evaluate the benefits of submicron diamonds in endodontic irrigation.
Effectiveness: Addition of 500 nm submicron diamonds improved smear layer, hard tissue debris, and E. faecalis biofilm removal.
Sealer Penetration: Enhanced bioceramic sealer penetration, with 500 nm submicron diamonds outperforming EDTA in depth.
Antimicrobial Activity: 500 nm submicron diamonds effective against S. mutans, but not E. faecalis.
Conclusion: Addition of 500 nm submicron diamonds to NaOCl combined with sonic agitation improve irrigation outcomes, making them a promising adjunct in endodontic treament.

OP155 | EFFECTIVENESS OF ALTERNATIVE IRRIGATION SOLUTIONS IN TISSUE DISSOLUTION: AN IN VITRO STUDY

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Aim: The ability of irrigating solutions to dissolve organic tissue is crucial for the success of endodontic treatment. Sodium hypochlorite (NaOCl) is well recognized for its tissue dissolution properties and has been extensively studied. However, the effect of etidronic acid (HEBP), a continuous chelating agent that can be used alongside NaOCl, on its tissue dissolution capacity requires further investigation. Additionally, no studies have examined the tissue dissolution properties of potential alternatives to NaOCl, such as bromelain, boric acid, and hypochlorous acid. Therefore, this in vitro study aimed to compare the organic tissue dissolution capacities of NaOCl, HEBP, boric acid, hypochlorous acid, and bromelain.

Methodology: The study utilized 5.25% NaOCl, %9 HEBP, 5% boric acid, 0.05% bromelain, 0.02% hypochlorous acid, and 0.9% isotonic saline as a control. Sixty fresh bovine tissue specimens were pre-weighed and immersed in each solution for 20 minutes, with solutions refreshed every 2 minutes. To ensure agitation, tubes containing the specimens were placed on a vibrator for 2 minutes. The samples were then blotted dry, reweighed, and the percentage of weight loss was calculated and statistically analyzed.

Results: The dissolution efficacy of six irrigation solutions was assessed by comparing pre- and post-immersion mass percentages. As the data did not follow a normal distribution (Shapiro-Wilk test), the Kruskal-Wallis test was applied ($p < 0.05$). Statistical analysis revealed that NaOCl, hypochlorous acid, boric acid, and HEBP exhibited comparable dissolution effects, whereas bromelain showed significantly lower efficacy than NaOCl. The control group exhibited mass increase due to fluid absorption. The findings confirm that NaOCl remains the most effective tissue solvent. However, hypochlorous acid, boric acid, and HEBP demonstrated similar dissolution efficacy, suggesting their potential as alternatives. Bromelain and saline exhibited the lowest dissolution effects. These results underscore the need for further research to develop biocompatible irrigants with effective tissue dissolution and continuous chelation.

OP156 | EVALUATION OF MOLECULAR INTERACTIONS OF VARIOUS ENDODONTIC IRRIGANTS USING PROTON NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY AND FOURIER TRANSFORM INFRARED SPECTROSCOPY

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Aim: to analyze the interactions between ethylenediaminetetraacetic acid (EDTA), citric acid (CA), glycolic acid (GA), etidronic acid (HEDP) sodium hypochlorite (NaOCl) and chlorhexidine (CHX) utilizing spectroscopic and chromatographic techniques.

Methodology: Experimental interactions were established using 17% EDTA, 17% GA, 17% CA, 17% HEDP, along with 5.25% NaOCl and 2% CHX solutions. Proton (1H) and Carbon (13C) Nuclear Magnetic Resonance Spectroscopy (NMR) were employed for characterization, adhering to pharmaceutical standards. Functional bond alterations in organobiological compounds were analyzed using Fourier Transform Infrared Spectroscopy (FT-IR). Metabolite structure changes following interactions were evaluated chromatographically via Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS). Hydrogen potential measurements and data analysis were conducted ($p<0.05$).
Statistical analysis of hydrogen potential level changes revealed no significant difference in the NaOCl+HEDP mixture compared to pure standards, while all other group comparisons showed significant differences ($p<0.05$). Solid-phase precipitation reaction was not observed in the NaOCl interaction groups, but physical precipitation occurred following CHX interactions with both EDTA and CA. Differences in peaks and mass spectra for metabolite products were identified, with new metabolites being detailed through LC-MS/MS. FT-IR analysis revealed carbon bond breaks in organocompaunds following interactions. Changes in hydrogen bonds were demonstrated through NMR spectra.

Results:

- Chemical interactions were observed between CHX and NaOCl solutions with the evaluated chelating agents.
- Interactions between CHX or NaOCl with EDTA, GA, CA, and HEDP led to changes in precursor ionization, solution polarization, or metabolite structures.
- Carbon bonds in EDTA and CA molecules broke during interactions with NaOCl or CHX, while minor changes occurred in HEDP and GA.
- CHX molecule structure disintegrated during the interactions.

OP157 | HYDROGEL - WHAT ABOUT AS AN ENDODONTIC INTRACANAL MEDICAMENT?

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Aim: We aimed to analyze the usage efficiency of hydrogel when used as an intracanal medicament on dentine via the pattern of dentine penetration and its effect on sealer penetration using a confocal microscope.
Summary Intracanal medication is crucial for advanced microbial control. However, the intracanal medicament must penetrate the dentine tissue properly and be able to be removed without leaving a residue in order not to jeopardize the sealing of the canal filling. In our study, hydrogels were synthesized, and three boron derivatives (boric acid [BA], sodium pentaborate [SPB], and disodium octaborate tetrahydrate [DOBT]) were laden. Their penetration into the dentine tissue when applied to the root canal was evaluated using a confocal microscope. Besides, after the removal of hydrogels, the penetration of the bioceramic sealer was also examined. Their effects were compared to calcium hydroxide (Ca(OH)2). A total of 150 mandibular single-rooted teeth were used (n=15). The groups of our study were Group 1 (BA-hydrogel), Group 2 (SPB-hydrogel), Group 3 (DOBT-hydrogel), Group 4 (BA-SPB-DOBT-hydrogel), Group 5 (calcium hydroxide). The penetration parameters were evaluated in the apical, middle, and coronal thirds. In the results, hydrogel had a deeper and wider penetration pattern even in apical thirds compared to Ca(OH)2 ($p<0.05$). The penetration of medicaments in root thirds was different ($p<0.05$). The removability of hydrogel was higher than Ca(OH)2 ($p<0.05$).

Key Learning points

" Hydrogels are a potential base material as intracanal medicament;
" Hydrogels penetrated even the apical third, characterized by narrow dentine tubules, which is important for improving microbial control in the treatment of endodontic pathologies;
" Hydrogels were better removed in the apical third than Ca(OH)2;
" Complete removal of intracanal medicament from the apical third without leaving residue is still noteworthy and needs to be addressed.

OP158 | MANAGEMENT OF TEETH WITH EXTERNAL CERVICAL ROOT RESORPTION THROUGH A MULTIDISCIPLINARY APPROACH: TWO CASE REPORTS

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Aim: External cervical resorption (ECR) is a progressive loss of dental hard tissues due to odontoclastic activity. This case report aims to present the treatment and follow-up of two patients diagnosed with ECR.

Methodology: Case 1: 55-year-old female patient with a medical history of hypertension and rheumatoid arthritis.
Case 2: 51-year-old female patient with osteoporosis, hypothyroidism, and arrhythmia.

Routine radiographic examination revealed external cervical root resorption affecting the left mandibular central incisors in both cases. Cone-beam computed tomography analysis showed asymptomatic resorptive lesions extending to the middle third of the root, with a circumferential width of less than 90 degrees and pulpal involvement (3Ap classification, Patel).

During the first session, antibiotic prophylaxis was administered to Case 1. In both cases:
Root canals were instrumented up to size 35.04, irrigated with 1.25% NaOCl and 17% EDTA, and medicated with calcium hydroxide (Calciplus, Imicryl, USA). In the second session, root canal treatment was completed, followed by ultrasonic activation using the WOODPECKER UDS-P LED E62 ultrasonic tip. A periodontal flap was elevated lingually to expose the resorption site. The root canals were obturated with a bioceramic sealer (PrevestDenPro Cerafill RCS, INDIA) and 35.04 gutta-percha. The resorptive defect was sealed with MTA (PrevestDenPro MTA Plus, INDIA), followed by PRF placement, and the flap was sutured.

Results: ECR is a dynamic process involving the periodontal ligament, dental hard tissues, and, in advanced cases, the root canal system. Predisposing factors include a history of orthodontic treatment (25.6%), traumatic dental injury (20.9%), cat ownership (15.8%), and parafunctional habits (10.2%). Treatment depends on the extent, location, and accessibility of the resorptive defect. Possible approaches include:

- External repair of the resorptive defect with endodontic treatment
- Internal repair of the resorptive defect with endodontic treatment
- Intentional replantation
- Periodic monitoring (for non-treatable cases)
- Extraction (for non-treatable cases)

OP159 | INTENTIONAL REPLANTATION OF A LATERAL INCISOR IN A PEDIATRIC PATIENT WITH TRAUMA AND DOUBLE VERTICAL ROOT FRACTURE (CASE REPORT)

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Aim: To evaluate the effectiveness of intentional replantation (IR) in permanent teeth of pediatric patients with vertical root fractures and their sealing with giomers.

Methodology: Intentional replantation involves extracting a tooth, treating it outside the mouth, and repositioning it in its socket. Although historically considered a last-resort measure, recent advances have significantly increased its success rate. Current studies report a survival rate of up to 89%.

The best outcomes are observed in teeth with a healthy periodontium. In a retrospective study of 157 teeth, a 10-year survival rate of 78.8% was found in cases with simple apical periodontitis, compared to only 36.9% in teeth with combined endo-periodontal lesions, with periodontal involvement being the main cause of failure.

Several factors can influence the prognosis: the presence of sinus tracts, lack of coronal restoration, extraoral time exceeding 15 minutes, or improper handling of the periodontal ligament tend to reduce the probability of success. On the other hand, meticulous surgical technique, the use of biocompatible materials, and proper restorations promote healing and tooth retention.

Intentional replantation of vertically fractured roots reconstructed with dentin-bonded resin may be considered for incisors as an alternative to extraction, although the long-term success is not optimal.

In conclusion, intentional replantation represents an effective, predictable, and more affordable therapeutic option than implants, especially when sufficient tooth structure is preserved, proper technique is applied, and the patient is not a candidate for an implant.

Results:
1. Resins can be a material we can attempt to use for sealing vertical root fractures, although we are aware of their prognosis.

2. Intentional replantation is an excellent treatment with a success rate of over 90%.

3. Periodontal disease can become a significant factor, although it will depend on key elements such as the patient's age and the type of tooth to be replanted.

OP161 | TOOTH DISCOLORATION IN ENDODONTICALLY TREATED TEETH: A CONSERVATIVE TREATMENT APPROACH

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Aim: To present a conservative, evidence-based approach for the management of tooth discoloration in endodontically treated teeth, with a focus on the principles, techniques, and clinical outcomes of internal bleaching as a minimally invasive esthetic treatment modality.

Methodology: Discoloration of non-vital teeth presents a significant esthetic challenge in dental practice, specially when the underlying cause is related to endodontic treatment or pulpal pathology. Tooth discoloration can be classified based on the etiological factors into extrinsic and intrinsic types. Intrinsic causes such as pulpal necrosis, intrapulpal hemorrhage, remnants of pulp tissue, medicaments (e.g., minocycline), and materials like gutta-percha or silver points. The walking bleach technique is one of the clinical methods for the management of those cases which involve adequate removal of endodontic filling materials below the cementoenamel junction (CEJ), placement of a cervical barrier to prevent apical leakage of the bleaching material and external cervical resorption, the use of a bleaching agent—typically sodium perborate mixed with distilled water or hydrogen peroxide. The rationale for selecting sodium perborate–water mixtures over hydrogen peroxide alone is due to the reported risk of cervical root resorption with the use of hydrogen peroxide. Clinical considerations such as number of bleaching sessions, degree of discoloration and proper sealing between appointments have been reported as a predictors of internal bleaching outcome. Additionally, potential complications including external cervical resorption, tooth fragility, and color relapse has been reported in the literature. Internal bleaching demonstrated a high success rates in terms of esthetic improvement and patient satisfaction.

Results:

Tooth discoloration can be classified into extrinsic and intrinsic types.
Placement of an adequate cervical seal, typically with glass ionomer cement, is a critical clinical step.
Sodium perborate mixed with distilled water is preferred over hydrogen peroxide.
Awareness of complications such as external cervical resorption and relapse is essential.

OP162 | CONSERVATIVE APPROACH TO TREAT COMPLEX CASES IN DENTAL TRAUMATOLOGY

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Aim: The aim of this presentation is to show a series of advanced clinical situations to better understand different trauma cases management techniques.

Methodology: Dental trauma management is not a one-size-fits-all process, and complex cases often require a specialized and multidisciplinary approach to ensure that all aspects of the injury are addressed comprehensively,leading to improved outcomes and higher care quality for the patient.
The great dilemma in managing dental trauma is the challenge that arises to make a difference in patients' lives, which forces us to stretch the limits, pushing the boundaries and exploring innovative, advanced or even unconventional approaches.
In most critical and advanced cases, trying to be conservative is very challenging and necessitates patience, skills, and advanced techniques; However, simple and low cost procedures can sometimes be very effective and successful.

Results: Mastering orthodontic and surgical extrusions techniques to preserve compromised roots after dental trauma. Early diagnosis and appropriate treatment of cervical root resorptions after orthodontic trauma. Appreciating the overlay concept as a conservative technique for reconstructing compromised roots after dental trauma.

OP163 | SHAPING THE FUTURE OF VPT: GSK-3 INHIBITORS AND TRUE DENTIN REGENERATION

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Aim: Vital pulp therapy is evolving with the introduction of novel biomaterials aimed at enhancing dentin and pulp regeneration. One of the most promising developments is the use of Glycogen Synthase Kinase-3 (GSK-3) inhibitors, such as Tideglusib and CHIR99021, which have been shown to activate the Wnt/B-catenin signaling pathway inducing dentin regeneration. This lecture will explore the regenerative potential of these inhibitors in human dental pulp stem cells (hDPSCs).

Methodology: This lecture will explore an exciting new approach to regenerative endodontics using GSK-3 inhibitors to enhance vital pulp therapy. Based on an in-vitro study, this research investigated how these inhibitors activate key biological pathways that promote natural tooth repair. The session will highlight how Tideglusib and CHIR99021 influence dental pulp stem cells, enhancing their ability to regenerate dentin and support pulp vitality. The study included cytotoxicity assessments, Wnt pathway activation assays, and odontogenic differentiation analysis. Study demonstrated that both inhibitors, at specific concentrations, promoted cell viability without cytotoxic effects. Tideglusib exhibited stronger influence on the Wnt pathway compared to CHIR99021. Both inhibitors enhanced stemness marker expression and promoted odontogenic differentiation, confirmed by Alizarin Red staining and upregulation of key odontogenic genes. These findings highlight the potential of GSK-3 inhibitors in advancing regenerative endodontics and improving clinical outcomes in vital pulp therapy.

Results:
• Understanding the role of the Wnt/B-catenin pathway in dental pulp regeneration and its activation through GSK-3 inhibition.

• Exploring the effects of Tideglusib and CHIR99021 on hDPSCs, including their impact on viability, stemness, and differentiation.
• Evaluating the potential clinical applications of GSK-3 inhibitors in vital pulp therapy and their role in enhancing pulp and dentin regeneration.

• Identifying gaps in knowledge regarding the long-term safety and clinical effectiveness of GSK-3 inhibitors in pulp therapy.
• Encouraging future research on drug concentrations, delivery methods, and in-vivo applications to t ranslate these findings into clinical practice.

OP164 | EFFECT OF CHITOSAN-BASED ROOT CANAL MEDICAMENTS ON THE RELEASE OF GROWTH FACTORS FROM INFECTED DENTIN MATRIX

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Aim: To evaluate the effect of chitosan (C) based root canal medicaments on the release of transforming growth factor beta1 (TGF-beta1) and basic fibroblast growth factor (bFGF) from infected dentin matrix.

Methodology: Fifty-two premolar teeth with single roots and canals were standardized to 12 mm length and prepared with K-files up to size 100. The external surface of root segments was covered with nail polish, and the inner root dentin was infected with Enterococcus faecalis for 21 days. Biofilm formation was characterized in two samples using a scanning electron microscope. Root canals were irrigated with 1.5% sodium hypochlorite (20 mL/5 min). The remaining 50 samples were randomly divided into five groups (n=10) based on root canal medicament: control group, calcium hydroxide/propylene glycol (PG), (Ca(OH)2/PG), C/PG, C/gelatin (G)/PG, C/ silk sericine/PG, and incubated for three weeks. After incubation, 17% ethylenediaminetetraacetic acid (20 mL/5 min) was used with Er: YAG laser activation to remove the medicaments. The root segments were placed in sterile eppendorf tubes containing 1 mL phosphate-buffered saline at 37 centigrade. TGF-beta1 and bFGF levels were measured by enzyme-linked immunosorbent assay at 24 hours. Each root canal volume was calculated using cone-beam computed tomography, and release levels were calculated per unit volume. Statistical analysis was performed using Shapiro-Wilk, one-way ANOVA, and Tukey tests ($p<0.05$).
There was a significant difference between the control and other groups ($p <0.01$). The highest release levels of bFGF were in the C/G/PG group (9.51±3.27), and the smallest amounts were in the C/PG group (6.40±1.84). Ca(OH)2/PG group (15.4 ±3.70) was significantly higher than the C/PG group (11.44 ± 3.39) in the TGF-beta1 release levels ($p=0.043$). No statistically significant difference was observed between C-based medicaments in TGF-beta1 levels ($p>0.05$).
Conclusion: C-based medicaments may be alternative agents for regenerative applications.

Results: Revascularization, Chitosan, Growth Factors, Root Canal Medicaments, Calcium hydroxide

OP166 | REGENERATIVE ENDODONTICS AND BIO-MINIMALIZM

T. TURK

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Aim: The aim of this lecture is to discuss the limitations and advantages of regenerative endodontic therapy and the role of biominimalism in modern endodontic practice. This lecture will also highlight the minimal biological endodontic treatment options for both vital and devital immature and mature teeth, based on personal clinical cases with long-term follow-ups.

Methodology: Biominimalism is an emerging philosophy that advocates for the conservation of natural resources and the reduction of environmental impact through the application of sustainable practices. In the field of medicine, this philosophy manifests as an approach that prioritizes the use of minimally invasive techniques and technologies to achieve optimal clinical outcomes while minimizing the impact on the patient's body. In endodontics, biominimalism is reflected in the desire to preserve natural tooth structures such as dentin and pulp, while effectively treating infections. Regenerative endodontics is a biologically driven procedure designed to replace damaged structures and cells of the pulp-dentin complex through biologically based minimal procedures. With advances in tissue engineering and other technological developments, endodontic clinicians now have access to new therapeutic approaches, such as pulpal regeneration.

Results:

- To review the role of biominimalism in endodontics
- To review the importance of pulp-dentin complex regeneration,
- To review different clinical cases and regeneration protocols,
- To review the future perspective for regenerative endodontic treatments.

OP167 | SOLVING THE OPEN APEX DILEMMA

O. MONTASER

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University of Leeds, School of Dentistry, Division of Oral Biology, Leeds, UNITED KINGDOM

Aim: This lecture aims to explore the challenges and advancements in managing teeth with open apices, focusing on evidence-based strategies to achieve predictable outcomes. It will cover the biological principles, material selection, and clinical techniques essential for successful treatment, including regenerative endodontics, apexification, and MTA apical plugs. By addressing the latest research and clinical protocols, the session will equip practitioners with the knowledge to make informed decisions when faced with the open apex dilemma.

Methodology: Managing teeth with open apices presents a unique clinical challenge due to the absence of an apical stop, complicating traditional endodontic approaches. This lecture will delve into the latest evidence-based strategies for addressing the open apex dilemma in immature, mature vital teeth and necrotic teeth. Treatment modalities such as apexogenesis, the use of bioceramic materials like MTA, regenerative endodontic procedures and apical plugs. By examining the biological basis, clinical indications, and long-term outcomes of various treatment modalities, this session will provide clinicians with practical insights to enhance their decision-making and optimise treatment success in immature or non-vital teeth.

Results:

1. Explore the anatomical and biological considerations that make treatment of open apices complex. Compare apexification, MTA apical plugs, and regenerative endodontic procedures, highlighting their indications, advantages, and limitations.
2. Discuss the role of bioceramic materials, particularly MTA and calcium silicate-based sealers, in achieving apical closure and long-term success.
3. Examine the principles, protocols, and clinical outcomes of regenerative approaches for immature necrotic teeth.
4. Provide a framework for selecting the most appropriate treatment modality based on case-specific factors.
5. Review clinical evidence and follow-up studies to understand the success rates and potential complications of different approaches.
6. Future Directions – Discuss emerging trends and innovations in managing open apices, including bioactive materials and tissue engineering strategies.

OP168 | INFLUENCE OF EDTA WITH PASSIVE ULTRASONIC IRRIGATION ON FIBRIN DENSITY AND BLOOD CLOT HOMOGENEITY IN REGENERATIVE ENDODONTICS

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Aim: The aim of this study is to investigate the effect of passive ultrasonic activation of EDTA irrigation, a critical step in regenerative endodontic treatment, on the homogeneity of the blood clot formed through the bleeding procedure.

Methodology: Introduction: The significance of EDTA irrigation in regenerative endodontic treatment is well established. Furthermore, given the limited extent of mechanical preparation, the activation of irrigation solutions is of critical importance. Methods: A total of 20 single-rooted and single-canaled teeth were included in the study, with 10 teeth in each group. The experimental groups were as follows: (1) Normal saline solution, and (2) EDTA with Passive Ultrasonic Irrigation. The roots were split, and human blood was introduced. The characteristics and fibrin density of the clots were examined using a scanning electron microscope (SEM). Blood clot structure in all irrigation groups were quantified using ImageJ software (National Institutes of Health, Bethesda, MD, USA). Additionally, density of the fibrin network was analyzed and classified by 1 examiner blinded to the experimental groups using a 4-level scoring system. The examiner received prior training with a set of calibration images derived from the pilot study. Statistical analysis was performed using the Friedman test and the Kruskal-Wallis test with Bonferroni adjustment.

Results: No statistically significant difference was found between the two groups in any of the sections. Similarly, no statistically significant difference was observed among the sections within each group. The hypothesis was accepted. Conclusions: In conclusion, this study demonstrated that EDTA activation did not significantly alter the effects on the blood clot in contact with intraradicular dentin. Therefore, EDTA agitation is considered a promising and beneficial option in regenerative endodontic procedures without causing additional harm to the blood clot.

EDTA activation did not significantly alter the characteristics of the blood clot in contact with intraradicular dentin.

OP171 | MIDDLE MESIAL CANALS – A CAUSE OF ENDODONTIC FAILURES IN NONSURGICAL ROOT CANAL TREATMENTS OF MANDIBULAR MOLARS

A. RITZI

Private practice, Bucharest, ROMANIA

Aim: The aim of this presentation is to raise awareness about the often-overlooked middle mesial canal (MMC) in mandibular molars, a factor critical for the success of nonsurgical root canal treatments. Moreover to provide indications into finding and shaping it.

Methodology: Mandibular molars, recognized as the most frequently endodontically treated teeth, exhibit considerable anatomical variations, particularly in the anatomy of the mesial root. Among these variations, the middle mesial canal poses a significant challenge, often overlooked during treatment due to its concealed location below dentinal projection and its small diameter orifice.
The failure to identify and address the MMC during endodontic therapy have been associated with a higher prevalence of endodontic lesions and lower healing outcomes. Previous studies indicate a direct correlation between untreated canals and elevated rates of endodontic failures.
Employing advanced imaging techniques such as cone-beam computed tomography has significantly improved the identification of these canals. Also, the use of magnification increased the probability of locating and negotiating them. Some anatomical landmarks of the pulp chamber floor such as : the presence of an isthmus, the MB-ML intraorifice distance, may indicate the presence of the MMC.
It should be taken into consideration the location of the MM in vicinity of the danger zone. This aspect might help clinicians in choosing the appropriate taper size in instrumenting the MM canal, which could prevent overinstrumentation and strip perforation.

Considering the high rate of endodontic failures leading to extractions, particularly in mandibular molars, awareness of tooth anatomy is paramount. Utilizing magnification and a thorough understanding of root canal anatomy can empower clinicians to predict possible complications and enhance treatment outcomes. Ultimately, the identification, cleaning, and shaping of MMCs could substantially reduce the incidence of treatment failures in nonsurgical root canal therapy of mandibular molars.

Results: Mandibular molar, middle mesial canal, root canal anatomy

OP172 | ANATOMICAL VARIATIONS OF THE ROOT CANALS: A HIDDEN ROUTES

A. FADAG

Yemeni Endodontic society, Sanaa, YEMEN

Aim: To explore and elucidate the anatomical variations present in root canal systems, emphasizing their implications for endodontic treatment and the importance of personalized approaches in dental care.

Methodology: This lecture will delve into the complexities of root canal anatomy, highlighting the variations that can occur between different teeth, individuals, and populations. We will discuss the significance of understanding these variations for successful endodontic outcomes, including their role in diagnosing and treating root canal infections. Case studies and imaging techniques will be presented to illustrate these variations and their clinical relevance

Results:

1. Recognize the common anatomical variations in root canal systems, including the presence of additional canals, lateral canals, and unusual canal curvatures.

2. Appreciate the critical role of these variations in diagnosing and treating endodontic issues effectively.

3. Familiarize yourself with advanced imaging techniques that can aid in identifying root canal anatomy before treatment.

4. Case Management: Explore case studies illustrating the impact of anatomical variations on treatment planning and outcomes.

OP174 | GENERALIZED HEREDITARY DENTIN DYSPLASIA - A TRANSPARENT SPECIMEN

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Aim: The aim of the lecture is to present the rare clinical picture of generalized dentin dysplasia in a 24 years old patient and his family. The teeth affected show a high incidence of pulp disease, and endodontic treatment is very difficult due to the complex pulp topography. The lecture will use the treatment case of an upper molar to specifically draw attention to this problem.

Methodology: The orthopantomogram of the patient, who had been referred for a root canal treatment of an upper molar, showed anomalies at all tooth roots in the sense of a generalized dentin dysplasia. Intraorally, no abnormalities were visible on the teeth. A CBCT scan of both jaws confirmed the initial suspicion of dentin dysplasia based on the following characteristics: pronounced curvature, taurodontism, intraradicular concentric aggregations of secondary dentin. The root canal treatment was unsuccessful due to the formation of a radicular cyst two years after endodontic treatment. The surgically removed root portions were decalcified with formic acid, the root canal system stained with ink and photographed macroscopically using transillumination with the aid of collimators. Due to an accumulation of phenotypic features in the family, a gene panel diagnosis was carried out for the patient and his parents. In the transparent specimen, the morphology of the dentin and the topography of the highly complex root canal system, which resulted in the persistence of the endodontic infection, are visible. The genetic examination of the family has not yet led to a diagnosis.

Results: A referral for endodontic therapy due to complex root anatomy revealed the diagnosis of generalized dentin dysplasia. The challenges in the clinical management of the patient are openly and critically presented to serve as a guide for similar cases. Transparent tooth preparations significantly promote quality assurance and critical reflection on one's own work.

OP175 | COMPARATIVE PHYSICO-CHEMICAL ANALYSIS OF CHLORHEXIDINE-BASED MIXTURE IRRIGATION SOLUTIONS: ENDOXAL VERSUS QMIX2IN1

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Aim: An effective irrigation process is crucial for the long-term success of endodontic treatment and currently no single solution meets all the requirements of root canal treatment. As a result, different endodontic solutions are often used sequentially or novel solution combinations and devices are being evaluated to achieve faster and more effective endodontic treatment. The objective of this investigation was to conduct analytical comparisons of two novel solution combinations -Endoxal and QMix2in1- with established analytical standards.

Methodology: Endoxal and Qmix2in1 and analytical-grade corresponding materials; ethylene diamine tetraacetic acid (EDTA) and chlorhexidine (CHX) were studied for the chromatographic and spectroscopic experiments. Fourier transform infrared (FTIR) spectroscopy and ultra-high-performance liquid chromatography (UHPLC) were performed. Cloudy-white precipitate was seen in the experimental mixture of CHX and EDTA; however, the clear liquid form was noted in both Endoxal and QMix2in1. UHPLC revealed that the CHX content in the Endoxal and QMix solutions was 313.26 ppm and 31.11 ppm, respectively. Endoxal and QMix functional groups mostly overlapped in FTIR spectral assignments, but the experimental mixture did not.

Results:

- CHX concentration in Endoxal is approximately tenfold greater than Qmix2in1.
- A greater concentration of surfactant may have been practical to inhibit interaction with EDTA, given the comparatively high concentration of CHX in Endoxal.
- The concerns regarding the toxicity of surfactants, particularly CTAB, demand more inquiry into the toxicity levels of these mixed irrigation solutions.

OP176 | EVALUATION OF POST-OPERATIVE PAIN FOLLOWING THE USE OF NANO-CALCIUM HYDROXIDE AS AN INTRACANAL MEDICAMENT: A RANDOMIZED CONTROLLED TRIAL

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Aim: Calcium hydroxide (CH) is widely used for its antimicrobial and anti-inflammatory properties; however, its limited penetration in the complex root canal anatomy may reduce its effectiveness. Nano-calcium hydroxide (nano-CH), with its smaller particle size, offers improved diffusion and potentially enhanced therapeutic outcomes. This study aimed to evaluate and compare post-operative pain levels following the use of CH and nano-CH as intracanal medicaments in root canal treatment.

Methodology: This randomized controlled trial included 90 patients with necrotic single-rooted teeth and periapical lesions. Patients were randomly assigned to two groups: Group 1 received CH, and Group 2 received nano-CH as an intracanal medicament. Following root canal preparation and medicament placement, post-operative pain was assessed using a 10 cm Visual Analog Scale (VAS) at 6, 12, 24, 48, and 72 hours. Inclusion criteria were patients aged 18-65 years without systemic conditions affecting pain perception. Exclusion criteria included recent antibiotic or analgesic use, pregnancy, and systemic diseases requiring antibiotic prophylaxis. Pain scores were compared to evaluate the effectiveness of nano-CH in post-operative pain reduction.
At all time points, post-operative pain levels between the CH and nano-CH groups were not statistically significant ($p>0.05$). VAS scores in the nano-CH group approached zero within 6–12 hours, whereas similar pain relief in the CH group occurred at 24–48 hours.
Acknowledgements:
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Results:
- Nano-CH and CH show comparable overall post-operative pain reduction.
- Nano-CH may provide faster pain relief (6–12 hours vs. 24–48 hours).
- Although not statistically significant, earlier pain relief with nano-CH may offer clinical benefits.

OP178 | BIOACTIVE COMPOUNDS AS ROOT CANAL IRRIGANTS: ANTIMICROBIAL, INFLAMMATORY REGULATION AND TOXICOLOGICAL ASSESSMENT

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Aim: To evaluate mechanisms of bioactive compounds of standardized samples of Propolis (PRO) and copaiba oil-resin (COR) compared to sodium hypochlorite (NaOCl) and their toxicological and microbiological effects.

Methodology: Biofilm removal and bacterial viability were evaluated on dentine discs and in dentinal tubule model. Dual-species biofilms were formed using Streptococcus oralis (J22) and Actinomyces naeslundii (T14V-J1) on dentine discs, while Enterococcus faecalis (ATCC29212) and Streptococcus mutans (ATCC20523) were used in the dentinal tubule model. The first model assessed biofilm removal and structural characteristics using optical coherence tomography (OCT) and colony-forming unit counting after applying PRO, COR, or NaOCl to statically grown biofilms. The second model evaluated the action of irrigants on bacteria located deeper within the dentinal tubules using Live/Dead® staining. Molecular docking simulations were performed to analyze interactions between the major bioactive compounds in PRO and COR and the agonist site of the Angiotensin II type 1 receptor (AT1R), given its key role in inflammation. Toxicological analyses were conducted by injecting escalating concentrations of PRO and COR into Galleria mellonella larvae. One-way ANOVA test was used for OCT and CFU/cm² analyses, while Kruskal–Wallis were applied to the intratubular model. Larval survival was evaluated using the Log-rank test. According to OCT analysis, PRO and COR resulted in similar biofilm reduction after immediate contact. CFU/cm² counting demonstrated decontamination following exposure to irrigants. Intratubular analysis showed that PRO and COR promoted disinfection comparable to NaOCl. Molecular docking analysis indicated that PRO and COR interact with AT1R, and toxicity assays demonstrated low toxicity in larvae. PRO and COR exhibited antimicrobial effects as root canal irrigants and demonstrated low toxicity in vivo. Bioactive compounds influence inflammatory pathways as cellular responses.

Results:
PRO and COR exhibited antimicrobial effects as root canal irrigants;
Demonstrated low toxicity in vivo;
Bioactive compounds influence inflammatory pathways as cellular responses.

OP179 | SODIUM HYPOCHLORITE ACCIDENTS DURING ENDODONTIC TREATMENTS: CAUSES, PREVENTION, DIAGNOSIS AND MANAGEMENT

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Aim: The aim of this presentation is to explain the causes, mechanisms, clinical signs, diagnosis, and treatment planning of sodium hypochlorite (NaOCl) accidents during endodontic treatment and to constitute a guide for the management of this complications.

Methodology: NaOCl is a fundamental material in root canal treatment due to its ability to dissolve organic tissue and its antimicrobial effectiveness. However, the clinical use of NaOCl can pose risks regarding the safety of both the patient and the clinician related to iatrogenic or anatomical causes. Extrusion of NaOCl in the periapical tissues or anatomical spaces during root canal treatment is the most common accident about it. By the way, it can be accidentally injected instead of local anesthesia or come into contact with the eyes, skin or mucosa of the patient or the clinician. Related to its cytotoxic characteristics, when it reaches the periapical or mucosal tissues, severe complications such as intense pain, bleeding, swelling, ulceration, neurological symptoms, tissue necrosis, and even life-threatening conditions may arise. Prevention of these accidents during the treatment and, if they occur, diagnosis and careful management of the situation is crucial for both the clinician and the patient. Follow-up of the patient is also essential to manage the further complications related to the accident.

Results:

• NaOCl accidents can lead to extensive tissue damage, life-threatening conditions, long-term health issues, and medical and legal consequences.

• Clinicians must understand the causes, mechanisms, clinical signs, diagnoses, and treatment plans of NaOCl accidents to effectively manage these situations.

• Symptom-based supportive care is a fundamental approach during the treatment of NaOCl accidents, with regular evaluation and referral to secondary healthcare services when necessary.

OP181 | THE ROLE OF 3D-PRINTED RESIN TEETH IN PRE-CLINICAL ENDODONTIC EDUCATION

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Aim: The aim of the presentation is to highlight the use of resin-based teeth produced through 3D printing technology in practical endodontic education.

Methodology: The educational journey of dental students includes both theoretical and practical training. Pre-clinical training contributes to the evolution of motor skills and the acquisition of relevant experience in a safe environment. It enables the students to develop the ability to apply their theoretical knowledge in practice. In preclinical years, endodontic and restorative procedures are traditionally performed on extracted teeth using various instruments. There are still limitations to using extracted human teeth in dental courses as ethical concerns, collecting sufficient numbers of samples, and the risk of infection transmission. Dental models produced with 3D printers provide an alternative to extracted teeth in dentistry education. With the rapid advances in technology and the increased availability of 3D printers, the overall potential for using printed models in dental education has attracted considerable interest, particularly for training students and enhancing practical skills. Human teeth can be scanned with 3D imaging techniques, digitized with appropriate software, and finally reproduced with a stereolithographic printer. This innovative approach allows samples to be designed in various sizes and curvature levels with features such as repeatability and reproducibility. The precision of the printing process is important for the production of tooth replicas. Thanks to this workflow, natural teeth can be simulated in any shape, including complex root canal morphologies. The use of 3D-printed teeth is recommended in the dental education practice of undergraduate students.

Results: In endodontic education, 3D-printed models help enhance the practical skills of dentistry students. Three-dimensional printing enables the production of new models that reflect the root canal anatomy in endodontics.

OP182 | ANALYSIS OF KNOWLEDGE COMPETENCY AND LEVELS OF FIFTH-YEAR DENTAL STUDENTS REGARDING ROTARY INSTRUMENT SYSTEMS

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Aim: Rotary instrument systems are widely used in modern endodontics, offering advantages over traditional hand files. However, the knowledge, proficiency, and awareness of dental students regarding these systems remain an important subject of investigation. Adequate theoretical and practical training is essential to ensure safe and effective clinical use. This study aims to assess the knowledge level, proficiency, and awareness of 5th-year dental students regarding rotary instrument systems, with a focus on their education, practical experience, and perceptions of these systems.

Methodology: Summary: A structured questionnaire was administered to 60 final-year dental students to evaluate their theoretical knowledge, clinical experience, and awareness of rotary instruments. The survey covered topics such as the principles of rotary systems, material composition, mechanical properties, sterilization and reuse protocols, fracture prevention strategies, and self-assessed competency levels. The collected data were analyzed descriptively.
86% of students reported receiving theoretical training, but only 75% had adequate hands-on experience. 93% expressed a strong desire for additional hands-on training and postgraduate courses on rotary instruments. Social media one of the educational source of learning rotary instruments (%40). While 93% correctly identified the nickel-titanium composition of rotary instruments, 40% had misconceptions about reciprocating motion and specific systems. The most commonly recognized method for preventing instrument fracture was adherence to manufacturer-recommended speed and torque settings (96%). Regarding self-assessed proficiency, 49% of students felt moderately competent, while 22% considered themselves inadequate. 90% of students acknowledged that rotary systems are superior to manual instruments in terms of efficiency and treatment outcomes.
Final-year dental students need enhanced clinical training, standardized sterilization education, and increased hands-on exposure for better proficiency.

Results: Key Learning Points:
Students reach to information about rotary systems via social media
%93 of students doesn’t feel confidence about Endodontic cases. They need extra education and courses.

OP184 | RELIABILITY OF INFORMATION IN YOUTUBE™ VIDEOS ON THE APPLICATION OF CALCIUM HYDROXIDE

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Aim: This study evaluated the quality of YouTube™ videos about calcium hydroxide dressing as an intracanal medicament during endodontic treatment based on the uploader and the video presenter.

Methodology: The definitions in the literature guided this research process. The search terms 'calcium hydroxide dressing, calcium hydroxide in endodontics, intracanal medicament' were selected and searched using the Boolean operator 'or.' In total, 22 videos of acceptable quality in English were found and subjected to assessment with a two-month interval.
The video quality was assessed using the Video Information and Quality Index (VIQI). The content of the videos was evaluated according to the 14-item criteria developed explicitly for this study. Additionally, data on video duration (minutes), source (general dentist/specialist dentist/company), presenter (general dentist/specialist), number of views, likes, and dislikes were recorded. The Interaction Index and View Rate were calculated. For statistical analysis, IBM SPSS Statistics 26.0 was used. Non-normally distributed data were analyzed using the Mann-Whitney U test, and normally distributed data were analyzed with the Independent Samples t-test. According to the study findings, no statistically significant difference was found in the interaction index and view rates based on the video's uploader or presenter. Additionally, there was no significant difference in the total usefulness scores concerning the video's uploader and presenter. The analysis revealed a significant finding; none of the evaluated YouTube videos provided high scientific content. When the video content was evaluated, there was no significant difference in the level of information and quality depending on the uploader; however, the quality of videos presented by a specialist dentist was statistically significantly higher ($p=0.019$). According to these results, the scientific accuracy of digital educational content must be questioned, as YouTube™ is not a reliably scientific source. If YouTube™ is used for education, expert-created, high-quality, videos should be prioritized.

Results: Calcium Hydroxide Dressing, Intracanal Medicament, YouTube™

OP185 | ADVANCING VISUALIZATION: INTEGRATING MICRO-CT, FOCUS STACKING, AND VR FOR HYPER-REALISTIC 3D TOOTH MODELS

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Aim: This study aims to present a novel workflow that combines micro-computed tomography (micro-CT) and image-stacking-based photogrammetry. This workflow achieves an unprecedented level of anatomical and visual accuracy and integrates them into virtual reality.

Methodology: Creating hyper-realistic tooth models is essential for advancing endodontic education, research and clinical simulations. This study presents a novel workflow that combines micro-computed tomography (micro-CT) and macro image stacking-based photogrammetry, achieving an unprecedented level of anatomical and visual accuracy.
Micro-CT provides high-resolution three-dimensional images, capturing detailed anatomical structures and variations. This volumetric data allows precise reconstruction of the tooth's internal morphology. However, this method alone did not produce realistic surface textures and optical properties such as transparency and colour variations.
Turntable photogrammetry enhanced by macro-focus stacking is used to capture external surfaces. This method also allows the colour map of the pulp floor to be captured, which is essential for solving complex anatomical cases. Combining multiple high-magnification macro images and focus stacking provides exceptional depth of field and clarity while preserving fine surface details such as microtexture, colour variations, transparency, and translucency. The processed images are then used in a photogrammetric pipeline to reconstruct a highly detailed 3D surface mesh with accurate colour and texture mapping.
This workflow integrates micro-CT for internal structures and focus-stacking photogrammetry for external realism to create anatomically accurate and visually authentic 3D models of teeth and implement them in virtual reality. Compared to conventional scanning techniques, this approach achieves higher accuracy of structure and appearance while maintaining efficient processing time.

Results:
Protocol for surface models from CT Data
Protocol for texturing models from image-stacking-based photogrammetry
Protocol for implementing in VR

OP186 | EVALUATION OF THE EFFECTS OF DIFFERENT DRYING PROTOCOLS ON THE BOND STRENGTH OF CALCIUM SILICATE AND EPOXY RESIN BASED ROOT CANAL SEALERS TO DENTIN IN REPEATED ROOT CANAL TREATMENTS

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Aim: The aim of this study was to investigate the effect of different drying protocols on the bond strength of calcium silicate and epoxy resin-based root canal sealer to dentin in primary endodontic treatment and retreatments.

Methodology: The bond strength of the sealers to the root canal is important for the long-term success of endodontic treatment. Since the sealers are affected by intracanal moisture at different levels, drying protocols are of particular importance.192 human mandibular premolar teeth were used for the study. The canals prepared up to Protaper X3 size were obturated with different drying protocols and two different sealers. 96 of them were retreated up to Protaper X4 file size and filled with the same procedure as follows;

- Paper-point / AH Plus
-Paper-point / AH Plus Bioceramic

-Endovac +Paper-point / AH Plus
- Endovac +Paper-point / AH Plus Bioceramic

-Ethanol +Paper-point / AH Plus
-Ethanol +Paper-point / AH Plus Bioceramic

-Irrigation Needle +Paper-point / AH Plus
-Irrigation Needle +Paper-point / AH Plus Bioceramic

All samples were subjected to push-out testing after 1 mm thick horizontal sections were taken from 3, 8 and 12 mm from the apex. Failure modes were examined under an optical stereomicroscope and saved as adhesive, cohesive or mixed failures.

Although higher bond strength values were found in samples using ethanol, no statistically significant difference was found in terms of bond strength between drying protocols in both sealers.

Different drying protocols did not significantly alter the push-out bond strength of AH Plus and AH Plus Bioceramic sealers in primary root canal treatment and retreatment procedures.

Results: In cases of retreatment in endodontic practice, drying the root canals with ethanol can be applied to obtain higher bond strength.

OP187 | DOES THE ROOT CANAL SEALER AND THE OBTURATION METHOD HAS AN IMPACT ON TIME REQUIRED FOR RETREATMENT?

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Aim: To evaluate the effects of different obturation methods with different sealers on the time required time for retreatment and the regaining the apical patency.

Methodology: Fourty extracted human mandibular premolar teeth were instrumented using the Protaper Next (Dentsply Sirona, Ballaigues, Switzerland) and then divided into four groups based on obturation methods (n=10);
Group BC-L: Lateral Condensation (LC) + Endosequence BC Sealer (BC) (Brasseler USA, Savannah, GA, USA)
Group BC-S: Single Cone (SC) + BC
Group AD-L: LC+ ADSEAL (AD) (Meta BioMed, Cheongju, Korea)
Group AD-S: SC + AD
After obturation, the root canal fillings were removed using the ProTaper Universal Retreatment System (Dentsply Sirona, Ballaigues, Switzerland). The time required for the removal procedure was recorded for each sample and each sample was evaluated for the regaining of apical patency. Data were anaylsed with Kruskal-Wallis H test. No statistically significant difference was found between groups in terms of the regaining apical patency ($p > 0.05$). However, a statistically significant difference was observed between the groups regarding the time required for retreatment ($p < 0.01$). Retreatment of the SC groups was significantly faster than that of the LC groups ($p < 0.01$). Additionally, Group AD-L required more time for retreatment than Group BC-L ($p < 0.01$).

Results:

- The removal of root canal fillings in LC groups took longer compared to teeth filled with SC.
- Group AD-L required the longest time for root canal filling removal.
- The obturation method and sealer type did not influence the regaining of apical patency.

OP188 | YOUTUBE™ AS AN INFORMATION SOURCE FOR NON-SURGICAL ROOT CANAL RETREATMENT PROCEDURES: QUALITY AND CONTENT ANALYSIS

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Aim: This study aimed to evaluate the content, quality and demographics of YouTube™ videos about Nonsurgical root canal retreatment (NSRCT) as an information source for clinicians, dental students, and patients.

Methodology: “Non-surgical retreatment,” “non-surgical endodontic retreatment,” “non-surgical root canal retreatment,” “non-surgical canal retreatment” and “non-surgical retreatment endodontic” were determined as keywords for the detection of YouTube™ videos related to NSRCT. Fifty-four videos were found and 20 videos met the inclusion criteria. All selected videos were evaluated according to 10 parameters. The videos were scored 1 if the videos contained information about the selected parameter, but if the videos did not contain enough information, they were scored 0. The quality of the videos was assessed using the video information, quality index (VIQI), and Global Quality Score (GQS). The statistical analysis was performed using One-way ANOVA to compare measurements across groups, followed by Duncan’s test for multiple comparisons ($p < 0.05$).

We found that 15% of the videos have poor, 50% have moderate, and 35% have good information. VIQI-1(information flow) and total VIQI scores demonstrated a statistically significant difference based on information content ($p< 0.05$). Specifically, while VIQI-1 and total VIQI scores did not show a statistically significant difference between the moderate and good information groups ($p > 0.05$), they were significantly lower in the poor information group ($p< 0.05$).
Conclusions: YouTube™ videos on NSRCT offer clinical insights into retreatment and serve as a supplementary resource for dental students and practitioners. However, improvements are needed to enhance patient education

Results:

- YouTube™ serves as an accessible platform for information on NSRCT but varies in content quality.
- YouTube™ can serve as a supplementary educational resource for dental students and practitioners, particularly for retreatment procedures.
- There is a need to enhance and regulate YouTube content to improve patient education regarding NSRCT.

OP191 | EFFECT OF RECIPROCATING MOTION ON THE FATIGUE BEHAVIOR OF ENDODONTIC FILES

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Aim: The effects of the reciprocating motion actuated from an electric motor on the stress distribution and fatigue behavior of the Nickel-Titanium endodontic files are investigated.

Methodology: Root canal treatment procedure of a real molar tooth is simulated using the Finite Element Method. Endodontic file ProTaper Universal F2 is selected for the study due to the broadly available test data in the literature. The geometry of the file and the molar tooth are acquired through 3D scanning. A tooth with an oval cross-section and significant canal curvature is used to understand the influence of the realistic curvature of a tooth canal on the fatigue behavior of endodontic files.

Nickel-Titanium is represented with a material model accounting for the inner hysteretic loop effect which is essential for an accurate prediction of the fatigue life of a shape memory alloy. Both continuous rotation and reciprocating rotation modes are analyzed. Simulation consisted of placing the file tip at the apical tooth section followed by a reciprocating motion. Cutting motion is simulated with 1500 rotation with fixed axial position, and a release motion is simulated with a 300 rotation with fixed axial position. The hysteresis energy density is used as evaluation criteria for low cycle fatigue life estimation of endodontic file.

The stress concentration at the apical section of the dentin indicates that the simulation correctly represents the endodontic procedure. The hysteresis energy is found to be 9.1% lower in the reciprocating mode compared to that in the continuous rotation mode, aligning with statements in the literature.

Results: Hysteresis energy density is shown to give promising results as a predictor of low cycle fatigue failure of Nickel-Titanium endodontic files. Simulations indicate that the reciprocal motion technique increases the fatigue life of endodontic files compared to the case where a continuous rotation mode is utilized.

OP192 | EVALUATION OF ENDODONTIC RETREATMENT VIDEOS ON YOUTUBE: QUALITY AND CONTENT ANALYSIS

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Aim: The purpose of this study was to evaluate the educational quality of Turkish endodontic retreatment videos on the YouTube platform.

Methodology: In the presence of resistant endodontic lesions or endodontic failure, treatment options are nonsurgical or surgical endodontic retreatment. The use of online educational tools has become mandatory during the coronavirus (COVID-19) pandemic, and YouTube has played a very important role in global dental education.
12 key words were used to scope videos related to endodontic retreatment. A total number of 34 videos out of 240 were included in the study. One endodontics professional and two PhD students scored the videos according to GQS and Modified DISCERN criteria.
Spearman correlation analysis was used to examine the relationship between video characteristics and quality scores. A positive significant relationship was found between the average GQS score and video duration and subscriber count. A moderate positive relationship was found between the total DISCERN score and video duration. No statistically significant relationship was found between other video characteristics and DISCERN scores.
Longer videos were found to have higher values in terms of both GQS and DISCERN scores. According to the DISCERN scale, the vast majority of videos do not include reliable sources of information. As a result, it is seen that the quality level of videos published on YouTube varies and that due to the inadequacy of information sources, attention should be paid to providing accurate information in the field of health. Future research could make a more comprehensive assessment by comparing the quality of health videos on different topics.

Results: As a result, it is seen that the quality level of videos published on YouTube varies and due to inadequate sources of information, attention should be paid to provide accurate information in the field of endodontic retreatment.

OP193 | QUANTITATIVE ANALYSIS OF THE STRENGTHENING EFFECT OF ROOT SURFACE TREATMENT WITH ER;CR:YSGG LASER ON HUMAN ROOT DENTIN

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Aim: Contemporary laser research continuously raise the need to consider laser in future protocols. The purpose of this study was aimed at evaluating the effect of root surface treatment with Er;Cr:YSGG laser on human dentin.

Methodology: Thirty matched pairs of human extracted teeth were kept in saline and divided into 2 groups. All teeth were treated following contemporary endodontic techniques. In group 1, apicoectomy was performed using a Lindemann bur. Resected roots were irrigated with chlorhexidine and surface-treated with citric acid. In group 2, apicoectomy and root surface treatment were performed using Er;Cr:YSGG with MZ5 tips at 6W, 25 Hz with air and water. Side-firing tips were used at 4.5W and 25Hz to strengthen dentin at the resected root surface. The treated resected root surfaces were viewed under SEM for descriptive purposes. They were subsequently sectioned, embedded in epoxy resin and polished. All specimens were subjected to a Vickers hardness tester and microhardness values were recorded to compare laser-treated specimens to those treated with conventional means.

Mean microhardness values of laser-treated specimens were 297 when compared to 86 for specimens that were not treated with laser. A paired t-test found the differences in microhardness values to be statistically significant ($p<0.05$). Laser resection and root surface treatment resulted in significantly increased microhardness of exposed dentin comparable to that of enamel. Exposed dentin also resulted in sealing of the dentinal tubules. The affected areas averaged 350 microns in depth.

Results: The findings of this study lead the way onto a possible paradigm shift and pave the way for future experiments aimed at strengthening root dentin during endodontic procedures.

OP194 | VIRTUAL REALITY AND HAPTIC SIMULATION IN SURGICAL MICROENDODONTICS

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Aim: To highlights the development and application of a novel virtual reality (VR) haptic simulation program in endodontic microsurgery (EMS) to prepare for a clinical case performed by a resident student.

Methodology: Endodontic microsurgery (EMS) procedures require a high level of precision and accuracy. The traditional method relies solely on a freehand technique, which is dependent on the operator and prone to challenges and complications. Virtual reality simulations are showing significant potential and gaining increased interest in dental education as a training resource. They offer a novel and non-invasive approach, allowing the operator to practice and repeat procedures without restrictions. The physical interactivity provided by haptic technology delivers tactile force feedback to the user. Currently, there are no VR simulators available that include software exercises for planning and practicing EMS procedures, along with real-time performance assessment.
In this case report, a patient presented with persistent apical periodontitis related to an endodontically treated maxillary right second premolar. Utilizing a validated digital workflow, cone beam-computed tomography images were converted into STL file format and optimized for VR simulation. The Virteasy Editor interface was used to generate graphics and touchable haptic solids representing different tissues (enamel, dentine, root canal filling, and bone). Following the creation of the virtual patient and the simulation of the endodontic lesion, a postgraduate student in endodontics executed in the evaluation stage ten sessions of ostectomy, root end resection, and ultrasonic retro preparation until reaching ideal standards of practice in the virtual scenario. The student then proceeded to perform supervised root-end surgery on the actual patient. A one-year, postoperative CBCT evaluated the healing outcomes.

Results:
- Outline the uses of virtual reality and haptic simulation in microsurgical endodontics.
- Assess the influence of virtual reality simulation on clinical practice.
- Discuss the benefits of combining virtual reality simulation with artificial intelligence

OP196 | PIONEERING THE FUTURE OF ENDODONTICS: INNOVATION DRIVING PRECISION, REGENERATION, AND PATIENT-CENTERED CARE

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Aim: To highlight innovations in endodontics that advance technology and patient-centered care.

Methodology: Endodontics has undergone significant advancements, with emerging techniques extending beyond conventional methods:

1. Regenerative Endodontics & Stem Cell Therapies:
Stem cells, scaffolds, and growth factors facilitate dental pulp regeneration in necrotic teeth. Gene therapy, including CRISPR-Cas9, shows promise for tissue repair and regeneration.
2. Precision & Personalized Endodontics:
Genomic and proteomic profiling enables personalized treatment by identifying genetic markers and molecular diagnostics, allowing tailored approaches based on immune response and inflammation susceptibility.
3. Artificial Intelligence (AI) in Diagnosis:
AI-driven models improve the detection of periapical lesions, root fractures, and complex root anatomy using CBCT and radiographs. Predictive analytics optimize treatment planning and assess failure risks.
4. 3D Bioprinting & Tissue Engineering:
3D bioprinting facilitates the development of biomimetic scaffolds for pulp regeneration and explores regenerating the dentin-pulp complex with patient-derived cells.
5. Nanotechnology & Bioactive Smart Materials:
Nanotechnology enhances root canal disinfection. Bioactive sealers promote dentin remineralization, while pH-responsive materials release antimicrobial agents when needed.
6. Microbiome Profiling & Targeted Antimicrobial Therapy:
Next-generation sequencing (NGS) identifies microbial compositions in infected canals, enabling targeted therapies that eliminate harmful bacteria while preserving beneficial microflora.
7. Dynamic Irrigation & Enhanced Disinfection:
Technologies like GentleWave® and laser-activated irrigation improve irrigant delivery and biofilm removal, enhancing disinfection in complex anatomy.
8. Minimally Invasive Techniques:
Minimally invasive methods preserve pulp vitality and maintain tooth structure while ensuring effective canal preparation.
9. Big Data & Long-term Outcome Studies:
Big data analytics evaluate long-term treatment outcomes, improving decision-making algorithms and global best practices.

Results: Embracing technological advances in endodontics enhances patient care, drives professional growth, and improves treatment outcomes.

OP197 | COMPLEXITY ASSESSMENT TOOLS: FILLING THE VOID

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University of Liverpool, Liverpool, UNITED KINGDOM

Aim: To introduce novel developments in the field of endodontic complexity assessment

Methodology: Complexity assessment tools and indices have been available for many years, recently however, there have been considerable developments in this field, particularly with the introduction of digital versions of these tools.

In this presentation, we will first discuss the benefits and applications of an ideal assessment aid, followed by an exploration of the various assessment tools currently available, both for endodontic assessment alone, as well as for restoration of the tooth as a whole.

Next, we will evaluate the usefulness of these instruments and discuss possible barriers to adoption in practice. We will also discuss the importance of evaluating the difficulty and feasibility of restoring the tooth when considering endodontic treatment.

Finally, we will introduce a novel assessment tool. Integrating with and inspired by established endodontic and restorative assessment indices respectively, the tool provides a comprehensive evaluation for practitioners to utilise in endodontic treatment planning

Results:

- Endodontic complexity assessment tools provide an objective method of evaluating case complexity and is a valuable aid for practitioners in endodontic treatment planning
- Tools are also available to evaluate the feasibility of restoring the tooth following endodontic treatment.
- Existing tools do not allow for a comprehensive analysis of both components in one package
- A novel tool is now available to provide a holistic assessment of both the endodontic and overall restorative challenges involved in treating a case.

OP198 | ENDODONTIC FAILURE REVISITED: HOW OCCLUSION CAN CHANGE THE GAME

C. CHAUDEAU

CABINET LES STRELITZIAS, SAINT-PIERRE, REUNION ISLAND

Aim: Improving occlusal skills for endodontists. Going beyond the traditionnal tap-tap and excursive mouvements in order to provide a better understanding in hidden links between occlusion and endodontics failure.

Methodology: Endodontic failures are often analyzed through three key factors: inflammation, bacterial persistence, and biomechanical integrity. But what if a hidden variable was influencing all three?

Occlusion is frequently cited as a factor in post-endodontic complications, yet its assessment remains vague and incomplete. Most evaluations focus solely on static occlusion (intercuspal position, lateral excursions), overlooking critical aspects like mastication dynamics, mandibular positioning, and patient-specific occlusal behavior. Could this limited approach explain some persistent pain, fractures, or reinfections?

This presentation will explore how occlusion can directly impact inflammation, bacterial control, and biomechanical stability, and, more importantly, how to observe it properly in endodontic cases. Through clinical examples and a reproducible assessment approach, we will address key questions:

- Inflammation & Occlusion: How prolonged occlusal stress can contribute to persistent periapical inflammation.
- Bacteria & Occlusion: Can occlusal overload compromise the conditions of endodontic treatment?
- Biomechanics & Occlusion: Why functional occlusion matters in post-treatment fractures and coronal leakage.
- Beyond « Check the Occlusion » – A simple yet comprehensive method to analyze occlusion effectively in endodontics.

By adopting a clear, practical framework, clinicians can integrate occlusal assessment seamlessly into their workflow. This session will provide concrete, illustrated clinical cases to guide practitioners in recognizing and managing occlusal factors that may be contributing to endodontic failures.

Is occlusion the missing piece in the puzzle of endodontic failure? Let’s take a closer look.

Results:
Understanding impact of occlusion in endodontics.
Upgrading occlusion comprehension and observation.
Improving occlusal skills for endodontists.

OP199 | RADIOGRAPHIC ANALYSIS OF DENTAL FINDINGS

E. GURSU SAHIN, B. KARASU

Cnkiri Karatekin University, Cankiri, TURKEY

Aim: This study aims to radiographically assess tooth loss, caries, restorations, apical lesions, root canal treatment quality, and endodontic-periodontal lesions in endodontically treated teeth.

Methodology: Materials and Methods: In this study, panoramic radiographs of 251 patients aged 18-80 who applied to ÇAKÜ Faculty of Dentistry were examined. The radiographs were evaluated by two independent specialist. Among the participants, 122 were female (48.6%) and 129 were male (51.4%). Panoramic radiographs were analyzed to assess caries, tooth loss and endodontically treated teeth. Caries severity was classified based on its extent in enamel, dentin, pulp or root. The number of non-carious and restored teeth, including crowns and bridges, was recorded.
The quality of root canal treatments was evaluated by canal filling density, apical extension, accessibility of all canals and coronal restoration adaptation. The presence of endodontic-periodontal lesions in treated teeth was also examined.
Periodontal status was assessed by alveolar bone loss, following the 2017 Classification World Workshop criteria.

Results: A total of 6567 teeth were examined, excluding 461 extracted teeth. Caries were detected in 1011 teeth (15.4%), with dentin caries being the most prevalent ($p < 0.001$). Enamel caries was more common than root caries.
Endodontic treatment was observed in 295 teeth (4.5%), with 53% considered adequate. Among them, 15.9% had endodontic-periodontal lesions. Apical lesions were found in 159 teeth (2.4%), occurring 1.8 times more frequently in males ($p = 0.0014$).
Caries extending to the pulp was significantly more common in males ($p < 0.01$).

Conclusion: The number of endodontically treated teeth was found to be significantly higher in females compared to males. Based on these findings, it is emphasized that expanding educational programs aimed at increasing awareness of oral and dental health within the community is essential.
Dentistry, radiographic analysis, endodontics, periodontics

OP200 | CORRELATION BETWEEN CRACKED TEETH AND ANATOMICAL TOOTH STRUCTURES

F. LIN, J. DENG, X. WANG, L. YUE

Peking University Hospital of Stomatology, Beijing, CHINA

Aim: To investigate the correlation between cracked teeth and anatomical features of teeth for early identification and prevention of the cracked teeth.

Methodology: Methodology: 83 cracked teeth from 68 patients were included. 69 volunteers with no cracked teeth were included as the control group according to gender, age, and tooth position. Digital models of the teeth were obtained by intraoral 3D scanning (3Shape, Denmark). 3D anatomical features of the teeth, including the cuspal inclinations and cuspal heights, were analyzed using 3-Matic (Materialise, Belgium). Paired t-tests were used to compare the differences between the two groups. Multifactorial logistic regression was performed to examine the correlation between anatomical tooth characteristics and cracked teeth.

Results: In maxillary molars, the functional cuspal inclinations of the cracked teeth were (31.87 ± 7.72)°, which were significantly higher than those of the control group (26.01 ± 7.01)°. In mandibular molars, only the functional cuspal inclinations were significantly higher in the cracked teeth (30.79±7.89)° than in the control teeth (24.53±6.97)°. For the cuspal height of maxillary molars, all cuspal heights were significantly higher in the cracked teeth than in the control teeth, except for the non-functional cuspal height of the non-cracked side. In mandibular molars, the functional cuspal heights of the cracked teeth were significantly higher than those of the control teeth. Multifactorial logistic regression showed the functional cuspal inclinations were correlated with the cracked maxillary molars. The functional cuspal height of the cracked side was correlated with the cracked mandibular molars.

Conclusions: There was a correlation between cracked teeth and characteristic tooth anatomical structures. There was a correlation between cracked teeth and characteristic tooth anatomical structures. For maxillary molars, a positive correlation was shown between cracked teeth and functional cuspal inclination. For mandibular molars, there was a correlation between cracked teeth and functional cuspal height corresponding to the cracks.

OP201 | ENDODONTIC MANAGEMENT OF EXTERNAL ROOT RESORPTIONS

S. CIL, M.E. KAVAL

Ege University, Deparment of Endodontics, Izmir, TURKEY

Aim: To evaluate the etiology, pathogenesis, and management strategies of external root resorption (ERR) and discuss advancements in diagnostic and treatment approaches.

Methodology: External root resorption (ERR) is a pathological condition characterized by the progressive loss of root structure due to odontoclastic activity. Unlike physiological resorption in primary teeth, ERR in permanent teeth is irreversible and may compromise tooth integrity. ERR is classified into surface, inflammatory, cervical, and replacement resorption, each with distinct causes and clinical implications.
The etiology of ERR includes trauma, orthodontic forces, periodontal infections, and systemic diseases. Its pathogenesis involves the disruption of protective layers such as precementum, leading to odontoclast activation through the RANK/RANKL/OPG signaling pathway. Early diagnosis is essential for effective management. While conventional radiography aids detection, cone-beam computed tomography (CBCT) offers superior accuracy in assessing lesion severity.
Management strategies depend on the type and severity of ERR. Non-invasive approaches focus on eliminating etiological factors and monitoring progression, whereas advanced cases may require endodontic therapy, surgical intervention, or regenerative techniques utilizing bioactive materials. Recent advancements in biomaterials and regenerative endodontics provide new opportunities for hard tissue repair and modulation of osteoclastic activity.

Results:

- ERR has a multifactorial etiology, and early detection significantly improves treatment outcomes.
- CBCT enhances diagnostic accuracy compared to conventional radiography.
- Management strategies range from conservative measures to surgical and regenerative treatments based on the severity of resorption.

OP202 | ENDODONTIC RESEARCH USING MEDICAL DATA WAREHOUSES

A. FOUAD

University of Alabama at Birmingham, Birmingham, USA

Aim: The aim of this presentation is to highlight the complexity involved in studying the relationship between endodontic diseases and systemic health. This relationship involves many confounding variables that are difficult to measure especially in a longitudinal study. Furthermore, the implications and credibility of implying causal inference in this relationship will be discussed.

Methodology: The relationship between endodontic disease and systemic health has received extensive attention in recent years. Associations between the pathogenesis and treatment outcomes of endodontic disease and the systemic health conditions are well documented. However, much of this information is based on the patients' recall and potentially selective recounting of their health conditions and tends to overly simplify the medical status. In this presentation, the value of using data from information systems that combine systemic and oral health will be discussed. Future directions in this area will also be addressed.

Results:

- Outline the major areas in which endodontic and systemic diseases have been studied using analyses of patient cohorts or populations
- Describe the limitation of data obtained from systems that have only oral health data
- Describe the complexity of electronic medical records and how this could benefit our understanding of the relationship of endodontic and systemic diseases.

OP203 | SEVERE EXTERNAL ROOT RESORPTION: A 15- YEAR JOURNEY AND BEYOND

L. MAALOUF

Boston University Henry M. Goldman School of Dental Medicine, Department of General Dentistry (Endodontics), Boston, USA

Aim: The aim of this lecture is to provide an overview of the treatment of severe external root resorption following canine impaction, with a specific focus on the conservative management approach. The lecture will emphasize the importance of interdisciplinary collaboration between endodontics, orthodontics, restorative dentistry, and surgery to achieve optimal results for such challenging cases.

Methodology: The lecture will explore different treatment options for managing severe external root resorption, particularly following canine impaction. It will highlight the importance of a multidisciplinary approach to ensure successful long- term management of these cases. The lecture will also feature a case report with 15 years of follow-up data, illustrating the long-term success of conservative treatment in preserving a maxillary central incisor despite severe external root resorption.

Results:

- Gain valuable insights into the management of severe external root resorption.
- Learn about the importance role of interdisciplinary collaboration in managing complex cases of root resorption.
- Gain an appreciation for the effectiveness of conservative treatment options in achieving favorable long-term preservation of tooth integrity, function, and esthetics.

OP204 | THE FUTURE OF ENDODONTICS

A. ISUFI, J. KIM

Boston University Henry M. Goldman School of Dental Medicine, Boston, USA

Aim: The aim of this presentation is to discuss new advancements and future directions in Endodontics, for diagnosis, treatment planning, during treatment of clinical cases and for education of students and residents.

Methodology: Technological advancements in Endodontics, including AI, imaging technologies, robotics, and virtual reality, are transforming the field by improving diagnostics, treatment precision, and patient outcomes. AI enhances diagnostic accuracy, while robotics automates complex tasks, reducing clinician fatigue and increasing consistency. Augmented and mixed reality, along with computer simulations, improve education, diagnostics, and treatment planning, offering opportunities for more precise, personalized, and predictive care. However, challenges such as high costs, data security, and ethical concerns must be addressed. The future of endodontics is promising, driven by innovations like AI and avatars, which enable more efficient and patient-centered care. The integration of AI, advanced imaging, AR, and robotics is reshaping diagnostics, treatment planning, and patient outcomes. To fully unlock their potential, overcoming existing challenges, maintaining ethical standards, and fostering collaboration between AI developers, engineers, and dental professionals is crucial. This collaboration will lead to more effective, personalized care. We are entering a transformative era in healthcare, fueled by interdisciplinary collaboration and technological progress.

Results: Technological Innovations: AI, robotics, and advanced imaging are transforming endodontics by enhancing diagnostic accuracy and procedural precision.
AI Application: AI aids in identifying dental conditions, facilitates treatment planning, and refines diagnostic processes, leading to better patient outcomes.
Robotics and Automation: Robotics are simplifying complex endodontic procedures, alleviating clinician fatigue, and improving both efficiency and accuracy.
Virtual and Augmented Reality in Education and Treatment: Virtual and augmented reality are reshaping education, treatment planning, and patient interaction in endodontics, offering tailored and predictive care.

OP205 | SOCIAL MEDIA CONTENT ANALYSIS OF ENDODONTIC SPECIALISTS

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GAZIOSMANPASA UNIVERSITY, TOKAT, TURKEY

Aim: This study aims to analyze the most popular social media posts from endodontic specialists with a substantial online presence. Specifically, it seeks to identify the primary topics they focus on and determine which types of content generate the highest audience engagement.

Methodology: Artificial intelligence was employed to identify the social media accounts of endodontists with at least 20,000 followers on Instagram and over 5,000 subscribers on YouTube. A comprehensive analysis was conducted on all posts shared by these doctors. The ten posts with the highest engagement (measured by likes) were selected for further examination.
To structure the evaluation, the content was categorized into four groups: educational content, case studies, technology and product promotion, and other (including personal, social, or non-clinical posts). Statistical analysis was performed using SPSS Version 19.0, with results considered statistically significant at $p < 0.05$.

Results:

- The most engaging content was systematically classified into four major categories.

- The category that generated the highest audience interaction was identified.

- Correlations between content type and the number of followers were examined.

OP206 | ELECTRICAL CONDUCTIVITY OF COMPOSITE RESINS: IMPLICATIONS FOR VITALITY TESTING AND CLINICAL PRACTICE

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Aim: The aim of this study is to investigate the electrical conductivity characteristics of composite resin-based restorative materials, with a particular focus on their interaction with vitality testing devices. The research examines how the material composition and specific properties of six commercially available composite resins influence their electrical conductivity and whether these properties have clinical implications for dental vitality testing.

Methodology: Composite resins are one of the most commonly used materials for dental restorations due to their aesthetic qualities, mechanical properties, and ease of use. However, their electrical conductivity, which may affect the functionality of diagnostic tools such as vitality testers, has not been thoroughly examined. This study evaluates six different composite resin materials, including those with varying filler content, resin compositions, and fiber reinforcements, to assess their conductivity. The results reveal significant differences in conductivity levels between the materials. Specifically, composite resins with higher filler content, such as fiber-reinforced resins, exhibit lower electrical conductivity, which could interfere with vitality testing outcomes. These findings suggest that materials with lower conductivity may affect the accuracy of vitality testing devices, potentially leading to misdiagnosis or altered treatment planning. This study provides crucial insights into the material properties that influence the electrical behavior of composite resins in clinical scenarios.

Results:
• Electrical Conductivity Differences: There are notable variations in the electrical conductivity of different composite resin materials, which can impact their use in clinical applications, especially with vitality testing devices.
• Impact on Diagnostic Tools: The conductivity of composite materials can interfere with the accuracy of dental vitality testing, influencing diagnostic decision-making and treatment planning.
• Material Selection Considerations: Understanding how filler content, resin composition, and fiber reinforcement affect conductivity can guide clinicians in selecting the appropriate material for restorative procedures and minimize potential diagnostic errors.

OP207 | CONSERVATIVE APPROACH IN MANAGEMENT OF DEEP CARIOUS LESIONS IN CLINICAL PRACTICE

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Aim: The aim of this case series is to show a conservative treatment for tooth presenting a symptoms of symptomatic irreversible pulpitis (SIP). Vital pulp therapy was the treatment of choice for these cases according to updated guidelines of management of deep caries lesions. The prevalence of deep caries has been increasing worldwide. With the aid of magnification and hydrophilic cements preserving pulp vitality has been more achievable by general dentists. Increasing awareness between the specialists and young dentists is important in such cases. This oral presentation will present a case series and short follow up duration for cases that have been treated by vital pulp therapy (VPT).

Methodology: The cases will mainly focus on how could we diagnose and put the right treatment plan according to the effecting factors, and to approach more objectively to a subjective topic which is pain. Moreover selecting the right material and restoring the tooth probably will affect the prognosis of the treatment. As a home message the speaker will advise the audience to give vital pulp therapies a chance in such cases without being worried about canal obliteration which will end in saving tooth vitality, time and face less complications in the treatment procedure.

Results:
*Vital pulp therapy.
*Diagnostic tools.
*Histological and clinical differences of the current diagnostic systems.
* It is always worthy to save a tooth vitality.

OP208 | USE OF 3D GUIDES IN ENDODONTICS: A BIBLIOMETRIC ANALYSIS OF THE LAST 10 YEARS

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Aim: Guided endodontics relies on both surgical and non-surgical treatment planning utilizing computerized technologies. Employing three-dimensional (3D) guides facilitates minimally invasive approaches, minimizing the risk of perforation and improving the accuracy of clinical procedures. This study aimed to present a bibliometric analysis of publications related to 3D guides in endodontics over the past decade.

Methodology: Publications regarding the use of three-dimensional (3D) guides in endodontics were searched in the Web of Science online database using the Clarivate search engine, from June 2015 to March 2025. The following keywords were used: guided endodontics OR 3D-printed AND access cavity AND apical surgery AND regenerative endodontics AND ototransplantation. The title, journal name, author, country, publication date, and keywords were recorded and analyzed. The bibliometric analysis was conducted using R Studio-Biblioshiny software.

The study included 147 articles that met the inclusion criteria. The year with the highest number of published articles was 2021, with China being the country with the most publications. The Journal of Endodontics published the most articles. The most cited article was authored by Zehnder MS., published in the International Endodontic Journal in 2016. Articles focusing on locating obliterated root canals using guided endodontics were the most frequently published topic. The majority of studies were case reports, followed by in vitro studies. The term guided endodontics was the most commonly used keyword.

Conclusion: Over the past decade, there has been a significant increase in research on the use of 3D printed guides in endodontics. These guides provide predictable outcomes and introduce promising techniques. Furthermore, they contribute to a shorter duration of endodontic treatments and minimally invasive procedures, which enhance patient satisfaction. However, there is a need for more extensive and long-term clinical trials to validate these findings.

Results: Guided endodontics, 3D printed, access cavity, endodontic microsurgery

OP209 | IS THERE ANY LINK BETWEEN CHANGES IN MIGRAINE SYMPTOMS AND ENDODONTICS?

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Aim: To draw attention to the potential reasons for changes in migraine symptoms following endodontic treatment, as observed in case reports and the relevance of the International Classification of Orofacial Pain (ICOP) in endodontic practice.

Methodology: The International Classification of Orofacial Pain (ICOP) has, for the first time, recognized oral tissues as a source of orofacial pain and highlighted the potential link between pulpal pain and central sensitization.
Cutaneous allodynia (CA), a condition in which normally non-painful stimuli induce pain, is a common feature of migraine and an indicator of central sensitization. Case reports have documented changes in migraine symptoms after endodontic treatment. Recent research suggests that allodynic migraine patients may experience dental pain during attacks. This finding advocates identifying migraine patients undergoing endodontic treatment and classifying these patients based on the presence of CA.
In addition to the integration of ICOP into endodontic diagnosis and treatment planning, classifying migraine patients as allodynic and nonallodynic is vital to accurately distinguish between pain associated with central sensitization and true endodontic pathology, thereby guiding appropriate treatment decisions.

Results:

- Migraine patients should be assessed with particular attention to CA.
- In migraine patients with CA, the pain of endodontically treated teeth during attacks may not indicate failure.
- In migraine patients without CA, dental pain during migraine attacks may indicate an underlying pulpal disease.

PARIS

CHALLENGES, OPPORTUNITIES AND NEW PERSPECTIVES IN ENDODONTOLOGY

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