



Endodontics: Where biology and technology merge

General Endodontic

- Martitude Martin

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These abstracts have not been subjected to Editorial review. The opinions expressed are those of the authors. The views expressed do not necessarily represent best practice, or the views of the European Society of Endodontology. General Endodontic posters will be displayed on Level 0 in the Exhibition Hall. Posters will be on display all day and the authors will be by their posters from 14:00 to 15:00 on the day stated * denotes the presenter

THURSDAY, SEPTEMBER 17th

Anatomy

GE1

Geometrical analysis of the pulp chamber floor in different morphological types of first maxillary molars with the aid of CBCT

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Aim To compare tooth dimensions, distances and angles between orifices on the pulp chamber floor of first maxillary molars with fused roots versus a group with Vertucci type IV configuration in MB root using CBCT.

Methodology Extracted human first maxillary molar teeth with Vertucci type IV configuration in their MB roots (group I) and those with fused roots (group II) were included in the study. Crowns were reduced to 2 mm coronal to the CEJ. Extensive access was prepared using an Endo Z carbide bur (Dentsply/Maillefer, Ballaigues, Switzerland). Four teeth were embedded into a specially prepared mold, adapted to the holder of a CBCT device (Scanora 3DX, Soredex, Tusuula, Finland). On the axial scans at the level of the chamber floor with all orifices in focus the following measurements were taken: 1) tooth dimensions in four directions: M-->D, B-->P, MP-->DB, MB-->DP; 2) distances between centres of all orifices, and 3) angles between lines connecting two centres of neighbouring orifices. Descriptive statistical analyses and adequate tests were processed using software package SPSS 20.0 (IBM, New York, USA).

Results Of the total 183 first maxillary molars 48 (26.2%) exhibited Vertucci type IV (group I), and 32 (17.5%) were with fused roots (group II). All the mean values of the dimensions in group I were significantly higher than in group II (2.443 < t-test < 9.106; 0.001 < p < 0.017). Only the distance between the orifice centre of mb2-->p was not significantly different between the two groups (t-test =1.825; p=0.072). Averages for all angles between two orifices were significantly different (2.747 < t-test < 9.685; 0.001 < p < 0.007).

Conclusions There were significant differences in tooth dimensions, inter-orifice distances and angles between first maxillary molars with fused roots and those with Vertucci type IV configuration in MB root.

GE2

The root and root canal morphology examination of the first lower premolars using RVG and tooth clearing method

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Aim On extracted first lower premolars we examined the root and root canal morphology using Radio Visio Graphy (RVG) and tooth clearing method.

Methodology In cooperation with Maxilofacial clinic of University Clinical center of Ljubljana we collected 166 extracted first lower premolars. Teeth were first scanned with a digital X-ray RVG (Kodak RVG Trophy, Eastman Kodak Company, USA) at 70 kV, 4 mA and exposition 0,036 s in the buccal-lingual and mezio-distal projection. After the pulp tissue was removed with sodium hypochlorite, the ink was inserted into the root canal system. Stained teeth were then dried with compressed air and demineralized with 5 % nitric acid for 4 days. With X-ray we examined whether the demineralization was completed. Teeth were then dehydrated using increasing concentrations of ethyl alcohol (70%, 96% and 99%) for 12 hours at each concentration. Dehydrated teeth were stored in methyl salicylic solution for later examination. Teeth were then photographed on operational microscope (Opti Pico, Zeiss, Germany) in buccal, mesial, distal and lingual projection. For the data analysis we used the methods of descriptive statistics.

Results 96.3% teeth had one root, 65.2% had one root canal, 33.5% two root canals and 1.2% had three root canals. In 65.2% of teeth Vertucci's type I was present, 62.1% first lower premolars were curved in apical part, most commonly in mesial direction. In 28.6% lateral root canals were found. **Conclusions** The first lower premolars are teeth with a lot of morphological deviations, such as lingual slope of the crown, occurrence of isthmus, apical deltas and also C - shaped root canals. General dental practitioners have to make a correct clinical decision in order to treat or refer.

GE3

Morphologic study of the radicular anatomy of mandibular and maxillary teeth by using Cone Bean Computed tomography (CBCT)

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Aim To describe and evaluate with the use of cone beam computed tomography (CBCT) the morphologic study of radicular anatomy of mandibular and maxillary teeth.

Methodology The present study will be a review of the literature of the radicular anatomy of mandibular and maxillary teeth using CBCT.

Results With this review we can affirm that the index percentage of canals located using CBCT is higher in comparison with classical literature that used less modern techniques such as conventional radiography, CT

Conclusions Lack of knowledge will lead the clinician to endodontic treatment failure because he/she will leave canals without instrument or filling.

The use of Cone Beam Computed Tomography (CBCT) for studying the root canal system anatomy is quite new. The common practice was to use conventional radiography, digital radiography, clearing the teeth, reinforcing radiographies using contrast, and at last, computed tomography. The use of the CBCT helps the clinician to know better the radicular anatomy of the maxillary and mandibular teeth to obtain an optimal and succesful result in endodontics.

Acknowledgements I would like to thank dr. Miguel Teixido for all the pacient and help he gave me.

GE4

Evaluation of the Mesial Root Canal Morphology of Mandibular First Molars in a Turkish Population by Cone-Beam Computed Tomography

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Aim In this study; we aimed to determine the root canal morphology of the mesial roots of mandibular first molars in a Turkish population using cone-beam computed tomography (CBCT). **Methodology** A total of 236 subjects with healty mandibular first molars were examined by using CBCT images. Details of gender and tooth position were recorded. The canal configuration of mesial roots were categorized according to Vertucci's and Gulabivala's methods and the additional types were explained in detail.

Results In the mesial roots of 384 mandibular first molars, Vertucci's Type IV (59,6%) and Type II (29,7%) canals were most frequent. The prevalence of Vertucci's Type III was higher in females (5,4%) than in males (0,5%) (P=0.002) and did not differ with tooth position (P=0.286). Gulabivala Type XII (3-2) was observed in teeth of six male patients, whereas none of the female patients have this root canal configuration. The incidence of a third canal, known as middle mesial, was 5,2%. Both Vertucci's Type VI (2-1-2) and 2-3-2 canal configurations were observed in 2,1% of the mesial roots of studied teeth.

Conclusions There is a high prevalence of two separate canals in the mesial roots of mandibular first molars of the studied Turkish population. CBCT is a useful tool providing detailed information about the root canal morphology and it can be concluded that clinically more attention should be given to the detection of additional canals in the mesial roots of mandibular first molars.

GE5

Detection of 2 or 3 canals in mesial root of first mandibular molar. Accuracy of two techniques. *Arrando A, Palomares M, Llena C, Esteve I, Ortolani PS Stomatology, Universitat de Valencia, Valencia, Spain

Aim To compare the ability to detect 2 or 3 canals in the first mandibular mesial root (FMMR) with cone beam computed tomography (CBCT) and visual inspection (VI) considering dental operating microscope (DOM) as gold standard.

Methodology 150 extracted FMMR were selected (after the approval of the ethical committee and with informed consents). With a CBCT device we analysed the number of visible canals at the pulp chamber floor and in the root coronal floor. Afterwards, we performed the pulp chamber access and the detection of the canals. It was done firstly by VI without magnification, using 08 and 10 K files, and later by VI with DOM and the aid of an ultrasonic tip. CBCT and VI examinations were performed by an observer and DOM by another one. Results obtained from CBCT and VI were compared with DOM. Sensitivity and specificity as well were assessed for each technique. Inter-examiner agreement was assessed using kappa statistics

Results Intra-examiner concordance for each of the used methods was >80%. 59.5% of the roots showed 2 canals and 39.3% 3 canals. Sensitivities for detecting 2 canals were 89.9% and 95.5% for VI and CBCT respectively. Specificity was 32.8% in both cases. Kappa test showed a 24.7% and 31.3% intra-examiner concordances (VI and CBCT respectively) when compared with DOM.

Conclusions VI and CBCT showed high sensibility to identify 2 canals in a FMMR. Nevertheless, both diagnostic methods have low sensibility to detect 3 canals.

Acknowledgements The authors are grateful to Dr. Forner for the supervision of the investigation and for reviewing the manuscript.

GE6

Posterior teeth apex relationship with the inferior alveolar nerve, for root canal treatment *Ortega Ramirez A, Pallarés A, Tolosa Such A *Universidad Católica de Valencia, Valencia, Spain*

Aim To study the impact rate of radicular apex contact of lower second premolars, lower first molars and lower second molars, both lefts and rights, regarding to the inferior alveolar nerve and to discover the causes that may alter the Inferior Alveolar Nerve functionality after the root canal treatment.

Summary A radiological study of 200 randomly chosen CBCT that met the requirement of having all of the lower second premolars, lower first molars and lower second molars on both sides, both left and right, was performed. The sex and age of each patient were recorded. The distance in millimeters between the apex of the second premolars, first and second molars, from both sides interchangeably regarding to the Inferior Alveolar Nerve was measured at CBCT.

GE7

Detection of second mesiobuccal canal in maxillary second molar teeth *Al-qudah AA, Alnia'mat M, Awawdeh LA *Conservative Dentistry, Jordan University of Science & Technology, Irbid, Jordan* **Aim** the purpose of this study was to compare the number of MB2 canals that could be detected in extracted maxillary second molars, by direct examination and dentine troughing, with the actual number after clearing of teeth

Methodology one hundred extracted maxillary second molar teeth were collected from dental clinics within north Jordan. After access cavity preparation, the floor of pulp chamber was examined to detect the main visible canals. For teeth in which MB2 canals couldn't be detected directly by endodontic explorer and size K-file; dentine troughing was used. To investigate the actual number of canals, all teeth were decalcified with 10% nitric acid, then dehydrated using ascending concentrations of alcohol and rendered transparent by immersion in methyl salicylate. The transparent specimens were examined by the naked eye, under good lightening, and canal configurations in the mesiobuccal root recorded. Root canal configurations were categorized into the first five types of Vertucci's classification (2005). The number of canals detected by each method was statistically analyzed using chi-square test. Statistical significance was considered to be p ≤0.05 **Results** dentine troughing increased the percentage of MB2 from 25%, detected by direct visual examination, to 43%. After clearing of teeth, the percentage of MB increased to 47%. Most (99%) distobuccal and all palatal (100%) roots had one canal

Conclusions the MB2 canal orifice could be detected through a clinical access cavity with careful use of a bur (troughing) in 43% of teeth. This was significantly higher than what could be detected by direct visual examination only (25%). The actual number of canals, as determined by the clearing technique was 47%



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AIM: To present two case reports showing the diagnosis and treatment of two dens invaginatus type I and type II with 1 year follow up.

INTRODUCTION: Dens Invaginatus (DI) is a abnormality resulting in a deepening or invagination of the enamel organ into the dental papilla prior to calcification of the dental tissues. The prevalence of DI varies between 0.25% to 10%, and the permanent lateral incisors are the most frequently affected

teeth.

On eruption, the invagination contains remnants of the dental papilla or periodontal connective tissue, these elements become necrotic and become nutrient rich environment following bacterial contamination from the mouth. Teeth are associated with an increased risk of developing pulpal pathosis, without any evidence of caries or trauma.

CASE PRESENTATION: This cases reports presents two different cases of dens invaginatus type I and type II. The treatment planning, was to diagnose the cause of pulpal necrosis, which was the invagination, the cleaning and shaping of the invagination, and the posterior root canal treatment for both cases, one with gutta-percha and the other an apical plug of MTA, both cases have more than one year of follow ups, showing a decrease of the apical radiolucencies .

TYPE I





DISCUSSION: Dens invaginatus might increased the risk of pulpal pathosis and complicate any root canal treatment . When an obvious communication with the pulp is apparent endodontic treatment could be considered in a similar way to necrotic pulps with Oehlers' type I lesions. The only difference is that type II invaginations are invariably wider and extend further apically.

CONCLUSSION: Cone beam computed tomography is a useful management tool for the management of complex endodontic problems, a succesful outcome can be achieved.

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GE9 WITHDRAWN

GE8

Imaging

GE10

Evaluation of sealing ability of different root canal sealers to dentin tubule orifices: an in vitro micro-CT study

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Aim We compared the presence of open/closed dentinal tubules (EndoSequence BC Sealer, Smartpaste bio, ActiV GP) and compared them with a root filling with AH Plus sealer using micro-CT in order to figure out the sealing ability of root canal sealers.

Methodology In total, 40 freshly extracted human single-root maxillary premolars without caries, root resorption, or fractures were used. Specimens instrumented with the EndoSequence NiTi rotary instrument were assigned randomly into four groups (n = 10 each). In each group, root canals were filled with single-cone gutta-percha and one of the tested sealers. Each specimen was then scanned using micro-CT at a voxel resolution of 1.72 μ m. Proportions of sections with open/closed dentin tubules and sealer penetration into the dentin tubules in cross-sectional images were calculated in the apical, middle, and coronal thirds. Differences according to root canal sealers were evaluated statistically using the Kruskal-Wallis test and the Mann-Whitney U-test at a significance level of 5%. **Results** The analysis showed higher number of closed tubules in the apical and middle third, with a significant difference between coronal thirds among bioceramic sealers (EndoSequence BC Sealer, Smartpaste bio), ActiV GP, and AH Plus (p < 0.05), also significant difference was found in coronal third for EndoSequence BC sealer among the sealers tested (p < 0.05).

Conclusions All root canal sealers tested resulted open dentin tubules. However, the proportion of closed dentin tubules for the bioceramic sealers (EndoSequence BC Sealer, Smartpaste bio) produced similar results and had the highest ability to seal the dentin tubules in the root canal.

GE11

Evaluation of penetration ability of different root canal sealers into dentin tubules: an in vitro micro-CT study

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Aim We compared the penetration ability of different root canal sealers into dentinal tubules (EndoSequence BC Sealer, Smartpaste bio, ActiV GP and AH Plus) using micro-CT Methodology In total, 40 freshly extracted human single-root maxillary premolars without caries, root resorption, or fractures were used. Specimens instrumented with the EndoSequence NiTi rotary instrument were assigned randomly into four groups (n = 10 each). In each group, root canals were filled with single-cone gutta-percha and one of the tested sealers. Each specimen was then scanned using micro-CT at a voxel resolution of 1.72 µm. Proportions of sections with open/closed dentin tubules and sealer penetration into the dentin tubules in cross-sectional images were calculated in the apical, middle, and coronal thirds. Differences according to root canal sealers were evaluated statistically using the Kruskal-Wallis test and the Mann-Whitney U-test at a significance level of 5%. **Results** The analysis showed higher penetration values in the apical and middle third with a significant difference among EndoSequence BC Sealer, Smartpaste bio, ActiV GP, and AH Plus (p < p0.05). ActiV GP also showed statistically higher values than the other sealers in the apical third (p < (0.05) but no significant difference was found in coronal third among the sealers tested (p > 0.05). Conclusions All root canal sealers tested a significant amount of penetration. However, the ActiV GP showed the highest ability of penetration into the dentin tubules.

GE12

Diagnostic value of Cone-Beam Computed Tomography for the detection of vertical root fractures in endodontically treated teeth. An in vitro study.

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Aim Evaluation of the effectiveness of digital radiography (DR) and cone-beam computed tomography (CBCT) in imaging of vertical root fractures in root filled teeth.

Methodology The root canals of 48 cattle lateral incisors were used in the study. Teeth were prepared and randomly divided into four groups: two experimental A and B in which vertical root fractures were artificially created and two intact groups C and D as controls. One experimental and one control group were filled with gutta-percha cones by lateral condensation method. All teeth were subjected to DR with the use of Kodak X-ray system and CBCT with CS 9300 CBCT machine. The images were evaluated by two observers. Statistical analyses of each imaging technique with or without root canal filling were calculated at the significance level p=0,05. Statistical program SPSS 22.

Results There was an improvement in the detection of artificially created vertical root fractures in nonfilled and root filled teeth using CBCT compared with digital radiographs. In nonfilled teeth fracture lines were observed significantly higher (p<0,05) in CBCT than in digital radiographs (91,65% vs 33,3%). Vertical root fractures in filled teeth were visible significantly higher (p<0,05) in CBCT scans than in digital radiographs (79,15% vs 29,15%). There was no statistically significant difference in detection of VRF in the presence of gutta-percha among the CBCT and DR.

Conclusions The Cone-Beam computed tomography with small field of view and high resolution ensures higher diagnostic effectiveness in the detection of vertical root fractures in root filled teeth than digital radiography. The presence of root canal filling did not influence significantly the overall accuracy of CBCT and DR.

Acknowledgements University grant number 502-03/2-044-01/502-24-031

GE13

Analysis of the cross-sections cone beam computed tomography to assess quality of root canal treatment of permanent teeth and the condition of periapical tissues. Epidemiological studies *Grochowina A, Pawlicka H, Kercz MM

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Aim A quantitative and qualitative analysis of root canal treatment of permanent teeth and the condition of periapical tissues based on an analysis of CBCT examinations among patients who reported for the first time to TMK Specialist Centre of Dentistry in Lodz, Poland

Methodology 816 CBCT examination were chosen, which met the criteria: examined patients had all permanent teeth, Field of View in cylindrical shape had hight 8,5 cm and diameter 8,5 cm or 14 cm, resolution of reconstructed images had 0,2 or 0,125 voxels, all of the teeth together with bone of maxilla and mandible should be visible on the panoramic view. Cross-sections of the tomography were assessed retrospectively by 2 observers. Panoramic view, axial cross-section and sagittal cross-section were evaluated. 20527 teeth were assessed. The following parameters of quality of the root canal filling was evaluated:

1.range of the root canal filling to the radiological apex ,according to criteria of De Cleen with own modification

2.number of ommited canals during endodontic treatment

3.condition of periapical tissues endodontically treated teeth and non endodontically treated teeth were assessed.

Results 13,7% of the evaluated teeth were subject to root canal treatment. 53,3% of them were filled improperly. Among 2803 teeth endodontically treated ,1907 inadequately filled canals and

1066 omitted canals were found. The proximal vestibular root canal (MV) in tooth 16 and in tooth 46 was the canal filled inadequtely in most cases. The biggest number of cases of omitted canals concerned tooth 16 and the proximal vestibulo-lingual canal (MV2). In 7,1% of evaluated teeth ,periapical tissue inflammation was observed. In total, periapical lesions were found in 1456 teeth, out of which 58,4% concerned teeth that had been improperly filled. The teeth not endodontically treated constituted the least numerous group of teeth with lesions (15,9%). 25.7% correctly filled teeth was diagnosed with periapical lesions

Conclusions The presence of improperly filled or omitted canals in a tooth treated endodontically made it possible to observe periapical lesions near the incorrectly treated teeth. The quality of canal treatment among examined pateient from Lodz is still unsatisfactory despite the development of modern techniques.

GE14

Outcome assessment of nonsurgical treatment of large periapical lesions *Scarlatescu SA¹, Dimitriu B¹, Didilescu AC² Departments of ¹Endodontology, ²Embryology, Faculty of Dental Medicine, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania

Aim To assess the outcome of endodontic treatment in teeth with large periapical chronic lesions, using radiographic methods and follow-up periods of one and two years.

Methodology Thirty-two adult patients (mean age 41.7, SD 11.2) were recruited for this study. Thirty-eight teeth with chronic periapical lesions of at least 5 mm diameter and high Periapical Index (PAI) scores were selected for either primary endodontic treatment or nonsurgical retreatment. All patients were treated by the same dentist in a private dental clinic. Root canal preparation was performed using ProTaper rotary instruments and irrigations with 2.5% NaOCI and 17% EDTA, followed by calcium hydroxide dressing for at least one week. Lateral compaction was used for root canal filling in 16 cases, whilst vertical compaction was performed in 22 cases. All teeth were radiographically assessed before and after treatment, as well as one year later. Nineteen teeth were also assessed two years after treatment. The PAI scores were used in order to evaluate the outcome. Statistical comparisons were done using nonparametric tests.

Results Overall, the periapical status improved significantly after one year (p < 0.0001, n = 38), although three cases of failure were noticed. Six teeth were considered healed, and 29 were assessed with better periapical status. A significant improvement was also recorded in the second year when comparing with first-year results (p < 0.0001, n = 19). Six teeth were considered healed, 12 with better periapical status and one case of failure.

Conclusions Despite the positive outcome of nonsurgical treatment of large periapical lesions, most of the cases were not completely healed, suggesting a need of follow-up period of at least two years.

GE15

Evaluation of the sensitivity of digital periapical radiographs in detecting external root resorption in different thirds

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Aim To measure simulated external root resorption (ERR) using digital radiography (DR). **Methodology** The ERR were simulated with different sizes mills with depth of 1.5 mm in 30 lower premolars. They were divided into two groups: the simulated resorption with 2 mm mill (Group 1) and 3mm mill (Group 2) were made in the three root thirds of all the specimens. The area of the milling was calculated and used as a parameter. The specimens were fixed in natural jaws and submitted to DR in three angles: ortho, mesial and distorradiais. The images were analyzed and the highest vertical image measurement was determinate using the Meazure program. Areas were calculated and the 95% confidence interval (95% CI) test was calculated. The parameters were: G1 = 3,14mm² and G2 = 7,07mm².

Results The values were underestimated in all groups and subgroups: G1mc 1,2889 (IC 95% 1,2332 - 1,3447), G1mm 1,2603 (IC 95% 1,1970-1,3237), G1ma 1,0681 (IC 95% 1,0022 - 1,340), G1oc 1,2379 (IC 95% 1,1983 - 1,2776), G1om 1,2367 (IC 95% 1,1770 - 1,2965), G1oa 1,0747 (IC 95% 1,0065 - 1,1429), G1dc 1,3045 (1,2372 - 1,3719), G1dm 1,2259 (IC 95% 1,1692 - 1,2826), G1da 1,1069 (IC 95% 1,0357 - 1,1791), G2mc 2,7869 (IC 95% 2,6431 - 2,9307), G2mm 2,6227 (IC 95% 2,4905 - 2,7548), G2ma 2,0043 (IC 95% 1,7864 - 2,2221), G2oc 2,8112 (IC 95% 2,6976 - 2,9247), G2om 2,7846 (IC 95% 2,6551 - 2,9140), G2oa 2,2224 (IC 95% 2,0186 - 2,4263), G2dc 2,8531 (IC 95% 2,7527 - 2,9594), G2dm 2,7551 (IC 95% 2,6003 - 2,9070) e G2da 2,1273 (IC 95% 1,9024 - 2,3523).

Conclusions The DR did not represent the clinical reality, underestimated all ERR.

GE16

Accessory mental foramina detection by cone beam ct in indian population: endodontic implications *Jaju S¹, Jaju P², Garcha V³

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Aim The purpose of the present study was to assess the accessory mental foramen using cone-beam computed tomography (CBCT) images in Indian population.

Methodology A total of 100 patients were enrolled in this retrospective study. The mental and accessory mental foramina, which show continuity with the mandibular canal, were assessed using axial and cross-sectional, 2-dimensional CBCT images. The sizes of the mental and accessory mental foramina were measured and statistically analyzed. Also, the distance between the mental and accessory mental foramina was measured.

Results The accessory mental foramen was observed in 8.4% of patients. There was no significant difference regarding the sizes of the mental foramen between accessory mental foramen presence and absence. Also, the mean distance between the mental and accessory mental foramina was 5.3 mm.

Conclusions The accessory mental foramen, which shows continuity with the mandibular canal, could be observed in 8.4% of the subjects using CBCT.

GE17

Evaluation the Quality of the Root Canal Fillings with Radiographs Taken from Two Directions Performed by Preclinical Dental Students on mandibular molar teeth

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Aim To evaluate the quality of access cavity and root canal filling of extracted human mandibular molars performed by the third year undergraduate dental students, with radiographs taken from two directions.

Methodology 79 students received preclinical endodontic training under the supervision of 4 senior and 3 PhD stuffs. All teeth were prepared using step-back technique and lateral condensation. Preparation steps as access cavity, working length, apical master file and cone, use spreader before filling were checked. 154 post-operative periapical radiographs in mesio-distal (MDD) and buccolingual direction (BLD) compromising 77 teeth with 231 canals were investigated. A Chi-square test was used for the statistical analysis. **Results** Acceptable access cavity rate was 12.7% and the optimal 87%. The radiographic quality was evaluated by three examiners according to the density and length. Adequate length and density were found 36% and 44% in two directions of radiographic evaluation, respectively. In MDD, the adequate length and density was found 49% and 78% for mesio-buccal, 52% and 77% for mesio-lingual, and 65% and 77% for distal canal, respectively. In the BLD, the adequate length and density were found 52% and 70% for mesio-buccal, 52% and 62% for mesio-lingual, and 65% and 64% for distal canal, respectively. The difference between the directions were only significant in the homogeneity evaluation (P<0.005). If the canals evaluated according to both length and homogeneity, the success rate was 22%. Apical transportation (23%), strip perforation (1%), and ledge (51%) were found.

Conclusions The technical quality of RCT performed by third year undergraduate dental students was found to be less than 50% according the radiographs taken in two directions with two evaluation criteria of length and homogeneity. However, the results were comparable to the other studies according to one evaluation criteria or one direction radiographic examination. For having good clinical outcomes after endodontic therapy, students in the preclinical level are required to practice more in endodontics.

GE18

Root and canal morphology of permanent mandibular molars in a group of Turkish population using cone beam computed tomography

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Aim To evaluate the root canal configuration of permanent mandibular first and second molars teeth in a Turkish population using cone-beam computed tomography (CBCT).

Methodology 257 male and 230 female (age range 18-70 yrs) were enrolled in the study. The CBCT examinations (Newtom 3G, QR Verona, Italy) which were required previously for their investigations were retrospectively evaluated. Cases where the anatomy was compromised by physiological or pathological processes and the original root canal morphology was not clear were excluded. A total of 805 mandibular molars were included the study. The following observations were recorded according to other studies: the number of roots and their morphology; the number of canals per root; the canal configuration; the frequency of distolingual roots in the mandibular first molars; the frequency of C-shaped canals in the mandibular second molars. The root canal configurations were also classified according to the method of Vertucci. Pearson Chi-square test were performed among canal configurations, sides and gender ($p \le 0.05$).

Results The majority of mandibular molars (95.5% of first molars, 95.7% of second molars) had two separate roots; however, three roots were identified 3.64% and 0.47% in first molars and second molars respectively. C-shaped roots occurred respectively 0.52%, 1.9% of first molars and second molars. In the mandibular second molars, most distal roots had a simple type I configuration, whereas mesial roots had more complex canal systems (Type I, II, III and IV configuration). No statistical significant difference was found among gender and sides (p≥0.05).

Conclusions The root number and morphology of 805 Turkish mandibular molars were examined using CBCT. There was a low prevalence of three-rooted mandibular molars in this Turkish population. CBCT scanning provides supplemental information. Morphological variations in the root canal system were found to be common in our study group. CBCT can be powerful tool for examination of this zone with capable of making measurements and 3D representations of the region with less ionizing radiation.

Importance of differential diagnosis of infections of odontogenic origin and unilateral maxillary sinusitis with cone beam computed tomography (CBCT): a case report *Neirynck M

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Aim To discuss the use of cone-beam computed tomography (CBCT) in the diagnosis of a unilateral recurrent maxillary sinusitis of odontogenic origin. The differential diagnosis is to be made between an infection of rhinogenous origin or odontogenic origin.

Introduction Maxillary sinusitis of odontogenic origin is a well-known condition in both the dental and otolaryngology communities. High-resolution CT scans and CBCT can assist in identifying or excluding dental disease. Sometimes dental treatment alone is adequate to resolve the odontogenic siunusitis and sometimes concomitant or subsequent functional endodscopic sinus surgery or Caldwell-Luc operation is required. (1) 30-40% of chronic maxillary sinusitis cases contributes to dental cause. (2) The accurate diagnosis of odontogenic maxillary sinusitis (OMS) is particularly important, because its path ophysiology, microbiology and treatment differ from those of other forms of maxillary sinusitis. Recognition of OMS is important because failure to address the dental pathology will result in failure of medical and surgical therapies and persistence of symptoms. Radiologic imaging can provide useful adjunct information in the diagnosis of sinusitis and particularly whether an odontogenic source may be responsible for the infection. (1) Negative dental evaluations do not definitively rule out a dental cause of sinusitis, particularly in the patient with recalcitrant chronic rhinosinusitis. (1)

Case presentation History: Healthy 66-year-old woman suffering from recurrent sinusitis for about two years. The patient visited an ENT doctor multiple times - for rinsing the sinus - and an oral surgeon. Bacterialogical culture of the sinus fluid by the ENT doctor indicates odontogenic origin. The ENT doctor referred to the dentist for further treatment, namely RCT of 27. The patient wanted a second opinion and visited an oral surgeon. A CT-scan was ordered by the oral surgeon. The expectation was oroantral communication. Both doctors and the general dentist concluded necessity of a RCT of tooth 27. Referral to the office for NSRCT of tooth 27. Clinical examination indicated no problem in the dentition of Q2. Cold and heat test were not aberrant, neither was there tenderness to percussion or palpation. Periodontal probing was normal. There was no pen-apical radiolucency detected on pen-apical radiograph. Diagnosis (both 23 and 27): normal pulp - normal apical tissues. Root canal treatment was not indicated. Referral for CBCT for further examination. Clinical findings CBCT: Unilateral maxillary sinusitis left with fluids in sinus Cystic-like injury locus 25 with opening to the maxillary sinus Continuous periodontal ligament around element 27 Element 23 also seems normal

Discussion Unilateral paranasal sinusitis is characterized by obvious primarily single-sided sinus lesions on imaging and chronic or recurrent symptoms of nasal congestion, buccal pain and ipsilateral postnasal drip. Most dentists face difficulty evaluating odontogenic infection involvement in sinusitis. Odontogenic maxillary sinusitis can be treated cooperatively by both dental and otorhinolaryngological specialist. (4) Periapical radiography is commonly utilized as the principal objective tool for assessing the outcome of treatment. CBCT has the potential to provide more accurate information about the presence/absence of periapical lesions. In this case CBCT was able to identify the exact origin and position of the defect, whereas periapical radiography was not. The lesion was limited only to the sinus floor. There was no direct correlation with the tooth. Maxillary sinusitis can be a complication of exodontia, as seen in this case. (5) Shahbazian etal. (2015) demonstrated in a study that periapical radiographs are not adequate in observing the anatomical relationship between maxillary molars and the sinus floor. When comparing results of CBCT and PA radiography, it seems that PA images cannot provide the clinician with sufficient information regarding anatomical relationship and pathologiy around the maxillary posterior teeth. (6) Treatment Surgery by an oral surgeon to remove the cystic-like lesion in the sinus floor. **Key learning points**

- PA radiography is not always able to visualize pathology in the maxillary molar area
- CBCT imaging may be used for visualization of anatomy and diagnosis of pathology in the posterior maxilla
- Small field of view CBCT (where possible) is an effective diagnostic device for endodonticrelated problems

GE20

Can you beleive your eyes? *Ruano Gómez J Máster De Endodoncia Avanzada, Facultad De Odontología, Universidad Europea De Madrid, Alcala De Henares, Spain

Aim With this research project we intend to implement a verification system failures in digital radiographs, whose malicious modification may be imperceptible. This is a problem of accuracy in controlling them, and that has not developed any reliable system to avoid such manipulations. **Methodology** 250 Digital intraoral radiography images manipulated and original were shown to dentists whose professional experience ranges from 2 to 20 years, which should indicate the original radiograph was considered, using the methodology of Visser and Krüger.

Results A high percentage of modified original radiographs were considered not depending on fault detection years of professional experience nor the different clinical practice thereof. The validation system is in test phase to be implemented in the dental clinic.

Conclusions

- It is necessary to establish a system of detection / validation of radiographic images.

- Malicious changes in digital radiographs may go unnoticed even experienced dentists.
- Professionals should know the legal consequences of these changes.

Irrigants/disinfection: Antimicrobial activity

GE21

Comparative evaluation of microbial reduction in root canals instrumented with reciprocating and rotary systems

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Aim This in vitro study aimed to evaluate the efficacy of the disinfection of root canal systems carried out with ReciprocTM and ProTaper UniversalTM systems using 1% sodium hypochlorite (NaOCI).

Methodology Sixty human single-rooted mandibular premolars were infected with Enterococcus faecalis, Pseudomonas aeruginosa, Staphylococcus aureus and Candida albicans, and then divided into 6 groups (n = 10): Group 1: ProTaper UniversalTM + 1% NaOCl; Group 2 (positive control): ProTaper UniversalTM + saline; Group 3 (negative control without microorganisms): ProTaper UniversalTM + saline; Group 4: ReciprocTM + 1% NaOCl; Group 5 (positive control): ReciprocTM + saline; Group 6 (negative control without microorganisms): ReciprocTM + saline. Samples were collected before and after the completion of specific treatments, and plated in specific media cultures. The Fisher exact test was used for the statistical analysis of differences in terms of presence or absence of microbial growth among groups.

Results For all tested pathogens, significant differences (p < 0.001) were verified between the instrumentation systems used. ProTaper UniversalTM associated with 1% NaOCI completely eliminated all microorganisms. Microbial growth, however, was observed when ReciprocTM was used associated with 1% NaOCI

Conclusions According to the protocol executed for this study, the ReciprocTM system associated with 1% NaOCI was not able to eliminate completely E. faecalis, P. aeruginosa, S. aureus and C. albicans from the root canal systems.

GE22

Antibacterial Efficacy of 5% Ethanolic Extract of Propolis (EEP) Solution against Enterococcus Faecalis *Djauharie NK, Kamizar KZ, Kemala NI

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Aim The purpose of this study is to investigate the comparison of the antibacterial efficacy 5% EEP solution and 2% chlorhexidine solution against E. faecalis. 2% chlorhexidine is proven to be effective against Enterococcus faecalis (E. faecalis), however chlorhexidine is known to be toxic against several particular cells. Propolis is a non-toxic natural resinous substance. Furthermore, 5% Ethanolic Extract of Propolis (EEP) solution is proven to be effective against E. Faecalis.

Methodology 24 tubes were divided into 4 groups. On group 1 and 2, the tubes were filled with 1 ml of BHI suspension inoculated by E. faecalis and added 1 ml of the tested solutions. On group 3 and 4, the tubes were filled with 2 ml of BHI suspension, with and without E. faecalis, as control groups. All tubes were then incubated at 37°C for 24 hours. The value of optical density (OD) was measured using Elisa reader. The data were analyzed statistically using non-parametric Kruskal-Wallis test and Mann-Whitney test.

Results 5% EEP solution has the same antibacterial efficacy as 2% chlorhexidine against E. faecalis. **Conclusions** Antibacterial efficacy 5% EEP solusion is statistically equal to that of 2% chlorhexidine solution in eliminating E. faecalis

Acknowledgements Nilakesuma Djauharie, Kamizar, Nindhita Kemala, Departement of Conservative Dentistry, Faculty of Dentistry, University of Indonesia, Jakarta, Indonesia

GE23

Effect of different endodontic irrigants on biofilm matrix and bacteria *Tawakoli PT, Ragnarsson KT, Zehnder M

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Aim Endodontists prefer sodium hypochlorite (NaOCI) solutions over other strong disinfectants such as chlorhexidine (CHX) because NaOCI dissolves necrotic tissue. Research has shown that NaOCI solutions are also more effective than CHX counterparts in eradicating biofilm, yet this effect is not completely understood. Here we investigated the effect of NaOCI on the biofilm matrix and on the physical presence of bacteria therein.

Methodology Three-species biofilms (Streptococcus mutans UAB 159, Streptococcus oralis SK 248 (OMZ 60) and Actinomyces naeslundi OMZ 745) were grown anaerobically on hydroxyapatite discs for seven days at 37°C. Specimens were then exposed for 1 min to 5% sodium hypochorite (NaOCl), 2% chlorhexidine (CHX) or 0.9% saline (NaCl), as the control treatment (n = 6). Matrix and bacterial cell volumes were determined using combined Concanavalin A-/Syto 59-staining and confocal laser scanning microscopy. Volumes of each scanned area (triplicates/sample) were calculated using Imaris software. Data were compared between groups using one-way ANOVA/ Tukey HSD, alpha = 0.05. They are presented as means ± standard deviation.

Results The matrix volume of the CHX group did not differ significantly (P > 0.05) from matrix volume of the saline control treatment, while bacteria volume was significantly reduced (CHX matrix: $3.3 \pm 1.1 \times 10-3 \text{ mm3}$, bacteria $6.9 \pm 1.0 \times 10-3 \text{ mm3}$; NaCl matrix $4.0 \pm 1.1 \times 10-3 \text{ mm3}$, bacteria $11.6 \pm 3.0 \times 10-3 \text{ mm3}$). NaOCl treated specimens showed significantly lower matrix volume (0.09 $\pm 0.08 \times 10-3 \text{ mm3}$) and bacteria volume compared to the CHX and NaCl group ($0.005 \pm 0.006 \times 10-3 \text{ mm3}$; lower voxel intensity set at 5).

Conclusions Sodium hypochlorite shows not only a unique tissue-dissolving effect, it also reveals significant matrix dissolving properties and lyses bacterial cells. This may explain why NaOCl solutions have a unique potential in biofilm treatment amongst endodontic irrigants.

GE24

Evaluation of antifungal efficacy of Qmix as a final irrigant: an *in-vitro* study *KALYONCUOĞLU ELIF¹, ŞEN TUNÇ EMINE², ÖZER SEZIN², KESKİN CANGÜL¹, BİLGİN KEMAL³, BİRİNCİ ASUMAN⁴

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Aim To evaluate and compare the antifungal efficacy of Qmix, 5.25% NaOCI, 2% CHX, and 17% EDTA as a final rinse against C.albicans.

Methodology Ninety single-rooted teeth were randomly divided into 4 experimental groups (n:20 per group) and 1 positive (n:5) and 1 negative control (n:5) groups. Following root canal preparation, teeth were inoculated with C.albicans (ATCC 10231) and incubated for 72 h. Teeth were irrigated with one of the following as the final irrigant: (1) 5.25% NaOCl, (2) 2% CHX, (3) Qmix, (4) 17% EDTA. Aliquots from the samples were plated on 4% Sabouraud agar, and colony-forming units were counted.

Results Qmix, 5.25% NaOCI and 2% CHX were equally effective (P> 0.05) and significantly superior to 17% EDTA in eradicating C.albicans (P<0.05).

Conclusions Qmix proved to be effective against C.albicans when used as a final rinse.

GE25

Antifungal effect of human beta defensin-3 against C. albicans biofilms maturation *Lim SM¹, Ahn KB², Yoo YJ¹, Han SH², Chang SW³, Kum KY¹

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Aim To evaluate the antifungal efficacy of human b-defensin-3 (HBD3) peptide on C. albicans biofilms maturation.

Methodology C. albicans were cultured in a Yeast Malt broth. The samples were treated with 100 μ g/mL HBD3 solution. Standardized inoculum of the strain was incubated in aqueous HBD3 solution for 6h. Volumes of 0.1 μ L of the test suspension were cultured directly on YM agar and incubated at 37°C. The plates were inspected for growth at 24h and the colonies were counted. In addition, the samples were treated with saline (control), 50 μ g/mL HBD3 solution, saturated calcium hydroxide (CH) and 0.2% Chlorhexidine (CHX) solution. After incubation for 24 hours, a crystal violet assay was used to analyze the biofilm formation. Bacterial growth was assessed by spectrophothometric analysis of optical density (OD). Statistical analysis was performed with Student t-test and a post hoc test.

Results C. albicans strains with HBD3 solution was killed 99.9% of the colony-forming units. Three medication groups showed a significant reduction of OD within the biofilms compared with the control group (P < .05). The HBD3 group was associated with significant lower OD values than CHX, CH or saline groups (P < .05). The CH and CHX groups showed higher levels of bactericidal activity than saline (P < .05), and there was no significant difference between the 2 groups (P > .05). **Conclusions** The HBD3 peptide exhibited more antifungal activity against biofilms maturation of C. albicans in vitro than either CHX or CH.

GE26 WITHDRAWN

GE27

In-vitro comparison of the effect of some antimicrobial agents against a group of oral pathogens. *González Nieto A, Prieto González L, Martínez Pinar A, Rubio Flores D, García Barbero E, Sawas Jiménez M

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Aim Comparing the effectiveness of the triantibiotic paste components, amoxicilin and clavulanic acid against Fusobacterium nucleatum, Actinomyces naeslundii y Enterococcus faecalis. **Methodology** The minimum inhibitory concentration of minocycline, metronidazole, ciprofloxacin, amoxicilin and clavulanic acid was determined by a microdilution test in Mueller Hinton agar, as required by EUCAST regulation. Subsequently, antibiotic combinations were completed with a concentration gradient to determine synergistic, additive or antagonistic effect. The results were determined by the analysis of the optical density of the bowls.

Results For Fusobacterium nucleatum, there were no differences between amoxicilin, metronidazole and minocycline; however ciprofloxacin showed less effectiveness. For Actinomyces naeslundii, there were no differences between amoxicilin and minocycline; however ciprofloxacin and metronidazole were less effective. Enterococcus faecalis was more sensitive to ciprofloxacin and resistant to metronidazole. The three bacterias were resistent to clavulanic acid.

Conclusions The three pathogens are sensitive to amoxicilin and to the components of the triantibiotic paste, with the exception to metronidazole, which was ineffective against Enterococcus faecalis. The combination of the components of the triantibiotic paste and amoxicilin with clavulanic acid has a synergic effect in the three cases. The triantibiotic paste is more effective against Fusobacterium nucleatum, while Actinomyces naeslundii y Enterococcus faecalis are more sensitive to amoxicilin with clavulanic acid. Since there is no formal protocol established in order to achieve the sanitizing of the root-canal, more studies would be required to evaluate the effectiveness of other antimicrobial agents, such as clorhexidine and sodium hypochlorite, in addition to other studies to evaluate the bacterial association in biofilm.

GE28

Flattened root canal decontamination by three different mechanized systems associated to passive ultrasonic irrigation

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Aim The main of this work was to evaluate the flattened root canal decontamination after instrumentation with the systems ProTaper, BioRace and Reciproc associated or not to ultrasonic agitation (US) of saline solution as irrigant.

Summary The main of this work was to evaluate the flattened root canal decontamination after instrumentation with the systems ProTaper, BioRace and Reciproc associated or not to ultrasonic agitation (US) of saline solution as irrigant. Eighty four human recently extracted mandibular incisors were selected. The teeth had a single but flattened root canal. Teeth were cleaned, sterilized and submitted to a new standardized contamination protocol with the reference strain Enterococcus faecalis. The teeth were divided into six groups: G1- ProTaper, G2-ProTaper with US, G3- BioRace, G4- BioRace with US, G5- Reciproc e G6- Reciproc with US. The instrumentation techniques followed the costumers' recommendation. Positive controls of contamination and negative controls were done. After biomechanical preparation of root canal, microbiological samples were performed with sterilized paper points, which were diluted in brain heart infusion (BHI) broth and spread on BHI agar for colonies forming units (CFU/mL) counting after 48 hours. Kruskal Wallis followed by Dunn

statistical tests were performed with a 5% significance level. Groups that utilized the ultrassonic agitation were more efficient than conventional irrigation, even so the saline solution was used as irrigant. The ProTaper system showed the best antimicrobial result than other systems. Reciproc with PUI could not reduce the same number of colonies when comparing to ProTaper without US. The Biorace system had the grater bacterial reducing when using US. The association of passive ultrasonic irrigation with the NiTi mechanized systems promoted better decontamination of flattened root canals. The ProTaper system showed more efficacy to reduce the CFU/mL than Reciproc and BioRace systems in this model.

GE29

Antibacterial effect of chitosan gel-based silver nanoparticles as an intracanal medicament Akyuz Ekim SN¹, *Erdemir A², Kaya OE², Ciftci H³, Celik F³

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Aim To evaluate the antibacterial activity of 1% chlorhexidine (CHX) gel, calcium hydroxide (Ca(OH)2) paste, 2% chitosan gel-based silver nanoparticles (AgNPs) as an intracanal medicaments on E. faecalis.

Methodology Forty six extracted human maxillary central incisors were used in this study. The teeth were decoronated and the root canals were prepared by using ProTaper instruments to size F4. After sterilization procedures, three root canals were divided as negative control and the other root canals were incubated with E. faecalis (ATCC 29212) for 1 week. Microbial samples were obtained using paper points before intracanal medication and colony forming units were counted. The three root canals were reserved as positive control. Forty root canals were divided into four groups according to the intracanal medicament used as follows; Group 1: 1% CHX gel; Group 2: Ca(OH)2; Group 3: 2% Chitosan gel with 23 ppm AgNPs, Group 4: 2% Chitosan gel with 47 ppm AgNPs. After 7 days, intracanal medications were removed using distilled water. The paper points were used to obtain microbial samples and the colony forming units were counted again. After intracanal medication, the percentage reduction in colony counts (PRCC) was determined. The data were statistically analyzed using one-way analysis of variance and Tukey (HSD) post hoc test. **Results** The highest PRCC was obtained with Chitosan gel with 47 ppm AgNPs (83.7%) and the lowest PRCC was obtained with Ca(OH)2 (74.2%). There were no significant differences among the all intracanal medications.

Conclusions Chitosan gel-based AgNPs showed the most favorable results and may have potential as an intracanal medicament.

GE30

Effect of Laser Activated Irrigation on biofilms in artificial root canals. Coenye T¹, *De Meyer S², Meire M², De Moor R² ¹Laboratory of Pharmaceutical Microbiology, ²Department of Restorative Dentistry and Endodontology, Ghent University, Ghent, Belgium

Aim To evaluate the antimicrobial effect of laser-activated irrigation (LAI) on biofilms in simulated root canals.

Methodology A dual-species biofilm of Enterococcus faecalis and Streptococcus mutans was grown in a resin root canal model. The simulated root canals were incubated for 48 hours and subjected to the following treatments: syringe irrigation (SI) with 27G needle at 1 mm from working length (3 ml with steady flow rate of 0.3 ml per second), ultrasonically activated irrigation with a #20 Irrisafe (UAI) for 20 seconds, LAI for 20 seconds (Er:YAG laser, 2940 nm, 400 μ m conical tip, 20 Hz, 50 μ s pulse length) with 20 or 40 mJ pulses. The fiber tip was held at the canal entrance or 6 mm from the working length. Both sterile saline and NaOCl 2.5% were used as the irrigant in all irrigation protocols. The number of CFU per resin block was determined by plate counting and compared across groups using Anova (P set at 0.05).

Results Using saline as the irrigant, significant reductions (P < 0.05) in viable counts were observed for UAI (0.52 log10 reduction) and for all LAI groups (> 1 log10 reduction), but not for SI (< 0.25 log10 reduction). LAI reductions were significantly higher than those of UAI (P = 0.01). With NaOCI as the irrigant, significant reductions in viable counts were observed for all treatment groups (> 2.9 log10 reductions).

Conclusions LAI removed more biofilm than UAI when using saline as the irrigant. When using NaOCI, greater bacterial reductions were observed and no significant differences between all treatment groups.

GE31

Photodynamic effect of curcumin and 450 nm laser against Enterococcus faecalis Polenik P, *Netolicky J Department of Stomatology, Charles University, Pilsen, Czech Republic

Aim The aim of this in vitro study is to test the nanoparticles loaded with the photosensitizer curcumin and laser light (450 nm) against planktonic and biofilm forming Enterococcus faecalis (E.f.). **Methodology** Suspension of E. faecalis was incubated with chitosan nanoparticles loaded with curcumin for 30 minutes and injected to the glass capillaries with diameter of 0.4 mm. Subsequently suspension was exposed to blue light at 450 nm by 200 µm fiber for 10 minutes. Moreover, experimentally infected root canals of human extracted teeth was treated with the same type of photodynamic therapy. Antibacterial activity was monitored by cultivation. Colony forming units per milliliter counts were evaluated and compared treated groups with control untreated suspensions of E.faecalis. The data were submitted to ANOVA test at a level of significance of 5%. **Results** In planktonic just as biofilm form of E.faecalis suspension. After irradiation by laser, curcumin as sensitizer was effective and significant bacterial reduction (p<0,05) was observed in comparison with curcumin assay only.

Conclusions The utilization of chitosan nanoparticles loaded with curcumin and irradiated by 450 nm laser may be a promising alternative in antimicrobial endodontic treatment. Next study will be directed to the antimicrobial activities of used nanoparticles inside dentinal tubules. **Acknowledgements** This project was supported by grant No. NT/13334-4 of Czech Ministry of Health

Irrigants/disinfection: Canal cleaning

GE32

The effect of grape seed extract irrigation solution of smear layer cleanse of apical third root canal wall.

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Aim Grape seed extract (GSE) consisting of 74-78% proanthocyanidin, is a cross linking agent. The aim of this study to investigated the ability of GSE irigation solution to clean smear layer on apical third of root canal wall.

Methodology Fifty extracted incisors teeth were divided into 5 groups. Grup 1 used aquadest irigation solution, group 2 used 3.25% GSE, group 3 used 6.5% GSE, group 4 used 13% GSE and group 5 used 17% EDTA. The cleanliness of smear layer were evaluated by SEM and scored. The data were analyzed using Kolmogorov-Smirnov test of SPSS 17.

Results Score 0 maximum in group GSE 13% (40%), score 1 maximum in group GSE 6.5% and EDTA 17% (70%), score 2 maximum in group aquadest (80%).

Conclusions Grape seed extract solution has a potential to remove smear layer on apical third of root canal wall.

GE33

Effectiveness of Photon-Induced Photoacoustic Streaming Technique with NaOCl Alone or Combination with 17% EDTA on Smear Layer Removal in Middle and Apical Thirds *Arslan H¹, Akcay M², Ayranci LB³, Capar ID¹, Gok T¹, Saygili G¹

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Aim To investigate the effectiveness of photon-induced photoacoustic streaming (PIPS) technique with 2.5% NaOCI alone and in combination with 17% EDTA on removal of the smear layer in the middle and apical thirds of the root canal as compared to passive ultrasonic irrigation (PUI), again using 2.5% NaOCI and with and without 17% EDTA.

Methodology A total of 48 extracted human upper central incisor teeth were instrumented up to a size of 0.40 mm, and randomly divided into four groups. A closed-end system was created, and the specimens were irrigated, as follows: (a) PUI with 5 mL of 2.5% NaOCl for 60 s; (b) PUI with 2.5 mL of 17% EDTA and 2.5 mL of 2.5% NaOCl each for 30 s; (c) PIPS with 5 mL of 2.5% NaOCl for 60 s; (d) PIPS with 2.5 mL of 17% EDTA and 2.5 mL of 2.5% NaOCl each for 30 s. In the PUI groups, the ultrasonically activated file was inserted 1 mm short of the working length, but in the PIPS groups the fiber tip applied into the pulp chamber. Specimens were examined under a scanning electron microscope and the data were analyzed with Kruskal-Wallis and Mann-Whitney U tests with Bonferroni correction at the 95% confidence level (P = .018).

Results PIPS in the pulp chamber with the combination of 17% EDTA and 2.5% NaOCl removed more smear layer than the other groups (P < .018).

Conclusions The in-vitro recording suggests that PIPS in the pulp chamber with the combination of 2.5% NaOCI and 17% EDTA better removes smear layer from the middle and apical thirds of the root canals than PIPS applied similarly but without EDTA or PUI with the same NaOCI and EDTA combinations using an ultrasonically activated file inserted 1 mm short of the working length.

GE34

Canal and Isthmus debridement efficacy using Laser Activated Irrigation *Passalidou S, Meire M, Calberson F, De Moor RJG Department of Restorative Dentistry, University of Ghent, Ghent, Belgium

Aim To compare in vitro the canal and isthmus debridement efficacy of syringe irrigation, manualdynamic irrigation (MDI), passive ultrasonic irrigation (PUI) and laser-activated irrigation (LAI) with Er:YAG laser with two different tip diameters (400 and 600 μ m).

Methodology Fifty extracted human mandibular molars with an isthmus in the mesial root, verified by Cone Beam Computed Tomography, were selected. Each tooth was embedded in resin and sectioned axially at 2, 4 and 6 mm from the apex. The tooth was reassembled with 2 guide pins and 2 metal bolts. The mesial canals were chemomechanically prepared up to a Protaper F2 file. Teeth were then randomly assigned to one of five activation groups (n=10) Group 1: conventional needle irrigation, 4ml of 2,5 % NaOCl using a 27G endodontic needle (Monoject, Sherwood Medical) with a flow rate of 0,3 ml/sec. Group 2: MDI, 100 push-pull strokes with gutta-perca cone in 60 s. Group 3: PUI, with a size 20 Irrisafe (Satelec Acteon group, Merignac, France) for 3 x 20 s. Group 4: LAI with 2.940 nm Er :YAG laser (AT Fidelis, Fotona, Ljubiana, Slovenia) conical 400 µm diameter fiber tip (Xpulse 400/14,Fotona) set at 20 mJ at 20 Hz, in the canal entrance for 3 x 20 s. Group 5: the same laser with a 600 µm fiber held in the pulp chamber for 3 x 20 s. Images of each section were taken after instrumentation and after final irrigation. Using imaging software, a cleanliness percentage was

calculated for each canal and isthmus. The difference in cleanliness was statistically analyzed using ANOVA (p< 0,05).

Results LAI and PUI were more effective in removing debris from the isthmus of mesial canal of mandibular molars. There was a statistically significant difference in isthmus cleanliness between the MDI and both laser groups, but there was no significant difference with the PUI group.

Conclusions The laser groups and PUI yielded significantly higher isthmus cleanliness scores than MDI.

GE35

The efficacy of photodynamic therapy and sodium hypochlorite in root canal disinfection by a single-file instrumentation technique

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Aim The aim of this in vitro study was to evaluate the efficacy of photodynamic therapy (PDT) and sodium hypochlorite (NaOCI) in root canal disinfection by a single-file instrumentation technique. **Methodology** Seventy human single-rooted mandibular premolars were infected with Enterococcus faecalis, Pseudomonas aeruginosa, Staphylococcus aureus and Candida albicans, and divided into seven groups (n = 10) according to the protocol of disinfection used. Group 1: 1% NaOCI; Group 2: 5.25% NaOCI; Group 3: saline + PDT; Group 4: 1% NaOCI + PDT; Group 5: 5.25% NaOCI + PDT; Group 6: positive control; Group 7:negative control. For PDT, methylene blue (15 μ g/mL) remained in the root canal for two minutes, followed by irradiation with diode Laser. Samples were collected before and after instrumentation and plated in specific media cultures, to assess the presence or absence of microbial growth and determine the average reduction of viable microorganisms. For statistical analysis, Fisher's exact test and the likelihood ratio test were used, adopting a significance level of 5%.

Results 5.25% NaOCl + PDT resulted in the highest number of specimens with no microbial growth. Also, 1% NaOCl and 1% NaOCl + PDT exhibited similar antimicrobial effects. Saline + PDT was not able to eliminate all microorganisms completely. There was statistical significant differences between the groups and the microorganisms.

Conclusions The association of 5.25% NaOCI with PDT was the most effective treatment against microorganisms from endodontic infection in root canals instrumented by a single-file instrumentation technique. This result shows that PDT can be useful to improve the root canal disinfection.

GE36

Effect of apical taper and irrigation needle insertion depth on apical irrigant pressure - ex vivo root canal model

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Aim To examine the effect of apical taper enlargement and irrigation needle insertion depth on apical irrigant pressure development.

Methodology Human maxillary canine root canal was cleaned and shaped with rotary files up to size 40, taper 0.04, patency size 10 at determined working length (WL). Apical foramen of the root canal was sealed up to closed system connected with digital manometer (PM-9100HA, Omega Engineering, USA) mounted onto device that enabled precise repositioning of the experimental

model elements. Notched open-end 27G irrigation needle (Appli-Vac; Vista Dental Products, USA) was inserted 2 and 4 mm shorter than the working length. Measurement of apical irrigant pressure (N=20) was performed respectively for each needle position at clinically realistic constant flow rate (0.1 ml/s) of 3% sodium-hypochlorite delivered by Precision Syringe Pump (Aladdin, World Precision Instruments, USA). Further root canal enlargement was processed to tapers 0.06, 0.08 and 0.10, maintaining size and patency, and apical irrigant pressure of described irrigation protocols (needle insertions and flow rate) was measured for each taper and needle position. ANOVA method was used for statistical analysis of results.

Results Potential statistically significant difference was analysed using two covariates: taper and needle insertion depth. The results ranged from the 20.50 ± 1.47 mmHg (taper 0.04, needle 2 mm shorter of WL) to 03.90 ± 0.94 (taper 0.10, needle 4 mm shorter of WL). Analysis based on the results of this study, show that both the increase of taper and needle distance from WL decrease apical irrigant pressure at constant flow rate, where needle insertion depth and taper were equally statistically significant (p<0.05) at 95% level of confidence.

Conclusions The increase of taper decreases apical irrigant pressure at constant needle position and flow rate. The increase of irrigation needle insertion depth develops increase of apical pressure at constant taper and irrigant flow rate.

GE37

Microscopical study of the influence of smear layer removal and the irrigants perfusion intro the root canals.

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Aim Evaluate the smear layer removal allowing the colorant difussion to determinate the different irigant penetration power.

Summary We choose one hundred and thirty teeth recently extracted that never showed any apical curve. These were sectioned by the cementoenamel junction limit in order to avoid the entry of obstacles to the root canal. The sample (n) was divided in 5 groups: Chlorhexidine 0,12% + EDTA (ethylenediaminetetraacetic acid) 17% (n1=30). Chlorhexidine 0,12% + Citric Acid 50% (n2=30). Sodium hypochlorite 5,25% + EDTA (ethylenediaminetetraacetic acid)17% (n3=30). Sodium hypochlorite + Citric Acid 50% (n4=30). Control group (n5=10) with saline solution. Samples were instrumented with Hedströem files stablishing the work lenght when the end of the file is seen in the apex and taking off 1mm. The final with was a 30 Hedströem file. Rhodamine B was infiltrated during 72 hours as staining agent. Samples were cutted into three sections and observed by microscope. Staining areas were measured using AutoCAD® software.

GE38

In vitro performace of DIAGNOdent pen and periodontal sapphire fiber tip in the detection of Enterococcus faecalis biofilms in root canals

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Aim The aim of this study was to evaluate the performance of the DIAGNOdent pen and a periodontal sapphire fiber tip on the detection and quantification of E. faecalis in root canals of bovine teeth artificially infected. The root canal decontamination by using 5.25% sodium hypochlorite or 2% chlorhexidine solutions was also assessed.

Methodology A total of 40 roots from extracted bovine incisors were used. The teeth were divided into four groups according to the contamination time and to the solution used for irrigating. The samples were evaluated in three depths (3, 8, and 12mm) prior contamination, after contamination

and after disinfection using DIAGNOdent pen and a periodontal sapphire fiber tip for determining the fluorescence of the dentine. The roots were immersed in BHI broth and autoclaved. The root canals were then contaminated for 7 or 14 days with E. faecalis ATCC 29212. After each period of contamination, samples were collected and grown in BHI agar to determine the number of colony forming units. The canals were flushed with the irrigants for 5 minutes. After neutralization a new microbial sampling and fluorescence measurements were performed. The results were statistically analyzed using SPSS 10.0 for Windows and BioEstat 5.0. The level of significance was set at 5%. Results Biofilms formed after a 7 and 14-days had higher values of fluorescence when compared to baseline (P < 0.05). It was observed that the solutions decreased the fluorescence values of the samples with no statistically significant difference between them, independent of the root third (P> 0.05). For samples in which biofilms of E. faecalis were formed after 14 days, statistically significant difference between the fluorescence of dentin before contamination, after contamination and after disinfection was observed, despite of the root third and the irrigant tested. There was a weak correlation between the fluorescence levels and the microbial load observed by culture method. Conclusions DIAGNOdent pen and the periodontal sapphire fiber tip showed potential to detect and quantify different levels of fluorescence in contaminated bovine root dentin. Irrigants were effective in reducing the number of CFUs in biofilms of E. faecalis induced during 7 or 14 days.

GE39

Irrigation dynamics characterization in lateral canals using two types of endodontic needles by computational fluid dynamics analysis

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Aim Evaluation of irrigation characterization in different angled accessory canals (lateral canals), utilizing two types of open-ended and closed-ended endodontic needles in order to realize efficient root canal cleaning .

Methodology Two Three-dimensional models with principal canal, which connected to different angled lateral canals were designed. In the first model, open-ended needle and in the another closeended needle were simulated, using COMSOL Multiphysics software. The parameters of model geometry were defined as 18mm the root canal length, 1.57mm the orifice diameter and 0.45mm the apex diameter (6.2% taper). Two types of cylindrical lateral canals with 1mm length, 100µm diameter and different 30°,60° angles, (from vertical axis apex) were simulated which placed in apical, medial, and coronal parts of the principal canal. Cylindrical needles were defined as 25 gauge with 0.26mm internal diameter placed 1mm shorter than working length. Distilled water have been introduced in the simulation and average inlet boundary flow rate of irrigation was set 0.33 (ml/s). Shear-rate and field velocity in the models have been calculated using Navier-Stokes and Continuity equations in the COMSOL Software. The average velocity and shear-rate through a center line of each lateral canal have been measured to demonstrate the performance of irrigation flow. Results Results demonstrated significant differences of streaming velocity and shear rate distribution between two types of needles (closed-ended and open-ended) which can be affected the performance of irrigation flow in lateral canal cleaning. The open-ended needle presented 10 times higher average velocity and 30 times higher shear rate, inside lateral canals in apical zone of the root. In addition, significant differences of velocity and shear rate distribution were observed between the two angled accessory canals. The generated average velocity in 30° angled lateral canals was almost 3 to 5 times (with maximum difference in lateral canals in apical zone) and shear rate was 3-times more than 60° angled lateral canals.

Conclusions Open-ended needles demonstrated more efficient irrigation in apical accessory canals whilst closed-ended needle demonstrated more efficient irrigation in principle canal. The numerical result presented less angled lateral canals from the apex would be more effectively irrigated with the generated irrigation flow.

GE40

Comparison of passive ultrasonic irrigation, EndoVac and ProUltra PiezoFlow on sealer penetration in curved roots.

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Aim Determine which of the studied irrigation systems show the best results of sealer penetration into dentinal tubules in curved root canals.

Methodology Sixty single-rooted extrated human teeth, with mature apices and curved roots (30^o-58^o). Rotary preinstrumentation with Pathfile P1, P2 (Dentsply, Maillefer), and rotary

instrumentation with ProTaper Next X1, X2, X3 (Dentsply, Maillefer). Canals were irrigated with 5.25% NaOCI. Teeth were randomly divided into four groups (n=15):

Group 1 (control): saline for 1 minute using conventional needle irrigation with needle Max-I-Probe (Hawe Neos; Kerr).

Group 2: 17% EDTA followed by 5.25% NaOCl using passive ultrasonic irrigation in both for 30 seconds (Irrisafe; Satelec).

Group 3: 17% EDTA followed by 5.25% NaOCl using EndoVac System (SybronEndo).

Group 4: 17% EDTA followed by 5.25% NaOCl using ProUltra PiezoFlow (Dentsply) as activator system.

A zinc oxide eugenol sealer, Pulp Canal Sealer (Kerr, SybronEndo), was used in the obturation, with Thermafil F3 (Dentsply, Maillefer). Each tooth was sliced using a low-speed saw (Isomet 4000), removing two 1-mm sections at 1 mm and 5 mm from the apex. Sections were imaged using a confocal laser scanning microscope (Leica TCS SP2). Regions where the sealer penetrates into dentinal tubules were evaluated and measured.

Results Kruskal-Wallis analysis detected a significant difference in the sealer penetration of the four groups (P<0.01); the ProUltra PiezoFlow System had more sealer penetration than the other groups, and had the best results at 5 mm from the apex. Nevertheless, passive ultrasonic irrigation showed the highest levels of sealer penetration at 1 mm from the apex. No significant differences were found between the sealer penetration at 1 and 5 mm from the apex in all specimens (P>0.01; P=0.397).

Conclusions ProUltra PiezoFlow, a continuous ultrasonic activation system, is the best device of the evaluated in this study, according to the measuring of the sealer penetration into the dentinal tubules in curved roots.

Irrigants/disinfection: Dentine infections

GE41

Microbiological analysis of a pulp of teeth at a chronic generalized periodontitis Atrushkevitch V¹, Tcarev V², *Galieva D¹

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Aim To prove necessity of endodontic treatment of teeth in patients with endoperio lesions and secondary endodontic involvement.

Methodology GI, electro-odonto-diagnosis, periodontal pocket depth (PD) were used to assess condition of periodontium and pulp in 70 patients of 28-60 y.o. Alveolar bone was evaluated using cone-beam computered tomography (CBCT). The main group included 50 teeth with retrograde

pulpitis in severe generalized periodontitis patients. Control group consisted of 20 teeth in periodontally healthy patients with pulpitis. PCR was used for microbiological evaluation of content of periodontal pocket (PP) and of root canal (RC).

Results Periodontal pathogen detection rate in patients of the main group was as follows: P. i. RC - 26.9 % and PP-26.9; T. f. RC - 57.7% and PP -46.2%; T. d. RC - 26.9% and PP - 26.9% A. a. RC-50%, PP - 61.5%. P. g. RC- 53.5% and PP -53.8%. Patients of the control group showed the following rate of periodontal pathogen detection: P. i. RC and gingival sulcus (GS) - 0%. T. f. RC-8.3% and GS - 0%; T. d. RC and GS -0%. A. a. RC - 16.7% and GS - 25%; P. g. RC- 16.7%. and GS-16.7%.

Conclusions It was established that microbial composition of content of root canals surrounded by deep bone defects is identical to microflora of a periodontal pocket. Thus root canal treatment for secondary endodontic involvement is indispensable before surgery.

Irrigants/disinfection: Irrigant agents

GE42

FTIR analysis of the effects of four irrigation solutions used in different irrigation regimes on dentin composition

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Aim Determine by Attenuated Total Reflectance of Fourier Transform Infrared Spectroscopy (ATR-FTIR) the changes in dentin composition after treatment with four irrigation solutions used in different irrigation regimes.

Methodology Twenty dentin fragments from bovine teeth crowns were polished and distributed in the following groups (n=5): G1: 2.5% Sodium hypochlorite (NaOCl, 5') + 17%

ethylenediaminetetraacetic acid (EDTA, 1'); G2: 2.5% NaOCI (5') + 0.5% peracetic acid (PA, 1'); G3: 2.5% NaOCI (5') + 9% etidronic acid (HEBP, 5'); G4: mixture containing 2.5% NaOCI + HEBP 9% (5 and 10'). G1, G2, and G3 received final flushs with 2.5% NaOCI for 0.5, 1, 3, 5, 8 and 10'. Samples were placed in microtubes containing 1.5 mL of the solutions and submitted to 15" of ultrasonic agitation for each minute. Spectra were collected with ATR-FTIR before and after each immersion in the irrigants; for each measurement it was evaluated the amide III/phosphate ratio. Analysis of variance (ANOVA) and Tukey's multiple-comparison tests (α <0.05) were applied to identify the intragroup and intergroup differences.

Results Intergroup differences were detected after the use of chelating agents in the following order G2>G1>G3=G4 (P<0.01). While HEBP was a weak chelating agent that caused little changes in dentin, AP was a strong chelator that caused more modifications in dentin surface. The NaOCI action prevailed in G4, with no statistical difference among periods analyzed. The encapsulated collagen removing by NaOCI is relatively slowly and show little change over several minutes. However, the NaOCI in demineralized surfaces (exposed by AP and EDTA) required only 0.5' to deprote the collagen matrix and to restore the dentin surface its natural proportion of amida III/phosphate. There are no differences among groups at the end of irrigation regimens tested.

Conclusions NaOCI degrades faster the collagen exposed by the chelating agents than the collagen encapsulated by hydroxyapatite. Among the chelators, the HEBP was the less aggressive to dentin. **Acknowledgements** This study was supported by State of São Paulo Research Foundation, FAPESP (Process 2013/19789-3)

Apex locators/working length GE43

Agreement of electrical measurements of endodontic working length when using multiple devices from the same manufacturer – An in-vitro-Study *Haupt FI, Hülsmann M Preventive Dentistry, Periodontology and Cariology, University of Göttingen, Göttingen, Germany

Aim To assess the agreement of electrical determination of endodontic working length obtained from four identical apex locators from five manufacturers each under various *in vitro* conditions. **Methodology** Seven single-rooted teeth and one mandibular molar were accessed and instrumented. Root canal length (RL) was measured inserting a file ISO 10 until the tip was visible at the foramen. Each tooth represented one of the following situations-

- i. Instrument inserted at RL
- ii. Instrument inserted at RL 0.5 mm
- iii. Instrument inserted at RL 1.5 mm
- iv. Instrument inserted at RL 3 mm
- v. Instrument inserted at RL ± 1 mm
- vi. Perforation, instrument inserted at RL 0.5 mm

vii. Incomplete root development (open apex), instrument inserted at RL

viii. Instrumentation of only one of three canals, instrument inserted at RL - 0.5 mm. Instruments were fixed to the teeth with resin in the respective position.

The devices tested were: RootZX (Morita, Kyoto, Japan), DentaportZX (Morita), ApexID (SybronEndo, Glendora, USA), ProPexII (Dentsply Maillefer, Victoria, Australia), Raypex6 (VDW-Antaeos, Munich, Germany). Teeth were irrigated with different solutions (NaOCI, EDTA, CHX) and measurements were taken with two different file sizes ISO 10 and ISO 25. All apex locators were connected to each of the 8 stations. Measurements were recorded when the apex locator showed a constant measurement for 5 seconds. Results were analysed using the Kruskal-Wallis-test (o=0.05).

Results The apex locators with the highest agreement among the 4 devices were ApexID and Raypex6, whereas DentaportZX and RootZX presented significantly lower agreement. PropexII showed significantly higher inter-device agreement than RootZX. Overinstrumentation was the situation showing the highest agreement among the devices from all manufacturers. Comparing the influence of irrigant and file size there were no significant differences among the devices for all types of apex locators. ApexID showed significantly better results with NaOCI than with CHX as irrigant, whereas PropexII apex locators showed higher agreement when CHX and EDTA were used. The highest agreement for measurements in case of a perforation showed ApexID and Raypex6. In the tooth with incomplete root development Raypex6 and PropexII showed the best results with a significant difference to DentaportZX.

Conclusion Different devices from one type of apex locator showed a high intra-device agreement. Nevertheless, general statements on the accuracy of one type of apex locator taken from studies investigating only one device per type should be drawn with caution.

GE44

influence of operator experience in the determination of the working length with electronic apex locators.

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Aim Compare the accuracy of expert and inexpert operators in determining working length. **Methodology** An ex vivo study was conducted with a sample size of 107 root canals. 3 undergraduate students as inexperienced operators and other 3 endodontic master students as expert operators. Each student performed taking the working length of each tooth with both LEA's at the brand "0.0" or greater foramen. The length was measured with a caliper ± 0.01mm. **Results** After making multifactorial ANOVA statistical test (p <0.05) showed that there were statistically significative differences between expert and inexperienced operators, but not in the taking of the working length according to the electronic apex locator.

Conclusions Inexperienced operators performed more coronal from the major foramen or "0.0" with respect to expert operators measurements. There were no differences between taking the LT with ROOT ZX[®] or Raypex 6[®]

GE45

Accuracy evaluation of four apex locators:An in vitro study *Sübay RK, Kara Ö Department of Endodontics, İstanbul University School of Dentistry, İstanbul, Turkey

Aim The purpose of this study was to evaluate the performance of 4 electronic apex locators (EALs) [Root ZX (EAL1), Raypex 6 (EAL2), ProPex II (EAL3) apex locators and VDW Gold endomotor with integrated apex locator (EAL4)] in wet and dry root canals with different apical diameters, in association with 3 file positions in the range of the last 1 mm of the canals.

Methodology Fifty roots were divided into 5 groups that were instrumented to the same foramen diameter using K-files in sizes 15, 20, 30, 40, and 60. EAL measurements were made using K-files when the file tip was at the foramen, 0.5 mm and 1.0 mm short of the foramen, when the apex lightly touched the surface of the saline solution or was immersed 3 mm into saline, and when the canal was dry or was irrigated with saline. The differences between the electronic lengths and actual lenghts were calculated. The data were analyzed statistically (P < 0.05).

Results 266 out of the 2400 measurements performed with 4 EALs showed that the file tip was beyond the foramen, while 227 of them had foramen diameters 0.40 and 0.60. 14 out of the 18 paired comparisons that were done to determine the accuracy of the 3 file positions showed no statistically significant differences between the EALs. 39 out of the 90 paired EAL comparisons related to the file positions in the foramen diameters showed statistically significant differences between the EALs.

Conclusions On average, the 4 EALs demonstrated 87.2% accuracy in locating the last 1 mm of the canals. The over-foramen readings with the EALs may increase in teeth with diameters of 0.40 mm or larger. Regarding the comparison of the EALs for the file positions with the different foramen diameters, the performances of the EALs were ranked as EAL3 > EAL2 > EAL1 > EAL4. The wet or dry canal and apex conditions may not adversely affect the accuracy of these EALs' readings.

Preparation: Cleaning ability

GE46

Shaping ability and cleaning effectiveness of niti rotary and resiprocating instruments on debris and smear layer scores: a SEM study *Ince S, Aydinbelge HA Department of Endodontics, Selcuk University Faculty Of Dentistry Department Of Endodontics, Konya, Turkey

Aim The purpose of the present study was to compare the shaping ability and cleaning effectiveness of two resiprocating single-file systems with ProTaper Next and ProTaper Universal rotary instruments during the preparation of single-rooted extracted teeth.

Summary Sixty freshly extracted single-rooted human teeth were randomly divided into 4 groups (n=15). In group 1, root canals were prepared with ProTaper Universal , in group 2 , they were prepared with ProTaper Next, in group 3, they were prepared with Wave One and in group 4, root canals prepared with Resiproc systems. Canals were prepared to the following apical sizes: ProTaper Universal F3, ProTaper Next X3, WaveOne Primary and Resiproc 25. The irrigant in all groups was 2 ml 2.5% sodium hypochlorite (NaOCI) solution, the final irrigation after preparation all groups was 2

ml NaOCl, 2 ml EDTA and 2 ml salin solution. The roots were split longitudinally into halves and the canals examined using a scanning electron microscope (SEM). The presence of a debris and smear layer was recorded at the coronal, middle and the apical thirds of root canals using a four step scoring scale. Data were statistically analyzed. All groups showed more efficient smear layer and debris removal coronally than in the middle and apical regions, whereas the mean total debris score and the mean smear layer score in all groups were less in the WaveOne and the Resiproc groups. Under the conditions of this study, for root canal cleanliness Resiproc and Wave One may be preferred rather than ProTaper Universal and ProTaper Next.

GE47

Ability of chemomechanical preparation of Self-adjusting file compared to newly designed rotary files in oval roots.

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Aim In this study we compared the chemomechanical ability of Self-adjusting file to newly designed rotary files, BtRace and Protaper Next, in oval single rooted teeth.

Methodology One hundred (n=25) caries free, single rooted oval teeth, (bucolingual to mesiodistal ratio >2.5:1, 5mm from the apex), were cleaned, sterilized and contaminated with Enterococcus faecalis stain (ATCC 29212). After random division into four groups, culture samples were taken before and after shaping with sterile paper cones. Teeth were shaped with four different techniques: group1 manual preparation, group2 SAF preparation, group3 ProTaper Next preparation and group4 BT-Race preparation. Irrigation was performed during shaping with 5,25% NaOCI 15ml for each group and smear layer was removed with 5ml EDTA 17%, which was inactivated with 5ml of 5,25% NaOCI. The last was then inactivated by 5 ml of 10% Na2O3S2 and washed away by distilled water. For each tooth, two microbial samples were taken: S1 after determination of the working length, and S2 at the end of shaping procedures. The S2 was taken using a modified approach described by Siqueira et al 2010.

Results Bacterial counts were transformed in logarithmic scale and analyses of covariance (ANCOVA) were implemented. Post hoc pairwise comparisons using the Tukey method were used after the main analysis. All three shaping methods resulted statistically significant to manual methods (p<0.001). In a comparison to baseline, which was manual shaping, since resulted the higher concentrations of bacteria in s2, the other shaping methods resulted -2.79 for g2,-3.31 for g3 and -4.03 for g4. The minus in front of each number, shows that in thesse groups the presence of bacteria was less in s2 compared to manual.

Even though no significance was found in a direct comparison between different NiTi shaping methods (Tukey method), Grous 3 and 4 (BT race & ProTaper next) performed better than group 2 in root debridement

Conclusions Even though the SAF, which until recently was considered the golden standard in shaping oval anatomies is e very valid choice, new designs in rotary files also provide valid alternatives. Considering standardization problems that the SAF provides during treatment, maybe such choices could be more convenient.

GE48

Cleaning and shaping flat-oval root canals with various mechanical systems. Part I: volumetric changes

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¹Dental Clinical Sciences, Dalhousie University, Halifax, Canada, ²Division of Endodontics, Pontificia Universidade Catolica do Parana, Curitiba, Brazil **Aim** To assess volumetric changes in flat-oval root canals after cleaning and shaping procedures with four different mechanical systems.

Methodology Seventy-two single-rooted extracted human mandibular incisor teeth with fully formed apices classified as flat-oval were scanned with a SkyScan 1176 micro-computed tomography scanner at 18-µm resolution and then assigned to one of the following 4 groups (n = 18), according to the system to be used for cleaning and shaping: ProTaper Next (PTN, X1 and X2), WaveOne (WO, Primary), Twisted File Adaptive (TFA, SM1 and SM2) or the Self-Adjusting File (SAF, 1.5-mm diameter). The specimens were then re-scanned as previously described and the data on the volume before and after cleaning and shaping were analysed using t-test and ANOVA.

Results All groups exhibited a significant increase in volume after cleaning and shaping procedures (P < 0.05). When comparing the volume difference among the groups the distribution of mean values was as follows: PTN (1.63 mm3) > WO (1.37 mm3) > TFA (0.94 mm3) > SAF (0.52 mm3); statistical differences were not found only in the comparisons between PTN and WO (P = 0.57) and WO and TFA (P = 0.1).

Conclusions Under the conditions of this study, all systems used for cleaning and shaping produced an increase in volume of the root canals. Further research is warranted to assess the implications of volume changes in the root canal system.

GE49

The efficiency of using the manual instrumentation versus the sonic or ultrasonic one for preparing the endodontic space.

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Aim The aim of this study was to reveal the quality of the wall dentine, after the action of various instruments by micro-electron scanning the slice surface.

Methodology To achieve the present study, 35 complete human teeth were used , extracted for orthodontic reason, which were grouped at random in 5 groups of 7 teeth, instrumented as follows: gr.1 —manual instrumentation (Kerr-file ,Spofa Dental Cehia); gr.2 —sonic instrumentation Sonic Air 1500 Endo Sistem, Micromega-France, using shaper-sonic-file); gr.3 - U.S.instrumentation (Suprasson P5 Booster,Satelec-Germany,using sono-file); gr.4 —combined instrumentation : manual/US; gr.5 : manual/sonic. After the instrumentation, the teeth were cross-sectioned and prepared in view of analyzing the MEB sections.

Results and discussion The results revealed significant differences (ANOVA test p < 0,001) between the sonic and US methods. According to most authors our results proved that the US instrumentation has higher effect on cleansing, achieving smooth surface covered by slight smear-layer. The sonic instrumentation had in close results, while the manual cleansing resulted in walls with more roughness and dentin debris. The best results were obtained by combining the manual method with the sonic or US one.

Conclusion The manual method proved to be basic in the complete preparation of the canal space but a higher performance is obtained by combining it with the sonic and US methods, which diminish the work time. The canals irrigation was used in all these cases.

GE50

In Vitro Comparison of Apical Extrusion of Debris between WaveOne System and Reciproc system *Carrillo AG¹, Pacheco A¹, Gonzalez V², Renteria MN¹, Carrillo LH¹, Bolanos O³, Cadena MA² ¹Department of Endodontology program post graduate, Universidad Autonoma de Baja California, Tijuana, Mexico, ²Department of Oral biology, Universidad Autonoma de Baja California, Tijuana, Mexico, ³Department of of endodontolgy, Kornberg School of Dentistry Temple University, Philadelphia, United States **Aim** The purpose of this in vitro study was to compare the amount of apically extruded debris using two different instrumentation techniques: WaveOne System (Dentsply Tulsa Dental) and Reciproc System (VDW, Munich, Germany) with a reciprocating movement.

Methodology Thirty-four extracted human mandibular molars with fully formed apices were divided into two groups of 15 (groups A and B), and two were used as positive and negative controls. Mesiobuccal canals were instrumented according to the manufacturer's instructions using Wave One System (25/08) technique in group A, and Reciproc System (25/08) in group B. Distilled water was used as irrigant. The apically extruded debris were collected in Eppendorf tubes (Quality™, Fremont, CA, USA), similar to that described by Myers GL, which were placed in a dehumidifier (Thermo Scientific Nalgene, Waltham, MA, USA) and weighted 3 times.

Results Based on the statistical analysis using the student-T test, statistically significant difference of the amount of apically extruded debris was found between the two techniques of instrumentation. **Conclusions** With the instrumentation techniques compared in this study, it was found that all produced apically extruded debris, and according to the results, less debris were observed with WaveOne system.

Preparation: Fracture resistance

GE51

Fracture resistance of over-flared root canals filled with MTA and resin-based material: an in vitro study

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Aim To measure the fracture resistance of over-flared roots filled with a variety of materials(guttapercha-nano HA, resilon-epiphany, composite and mineral trioxide aggregate - MTA)using the Instron machine test and micro-computed tomography (Micro CT) Scan. In addition, scanning electron microscopy (SEM) images were used to illustrate the type of fracture patterns of the specimens.

Methodology Canals of 120 roots of mandibular premolars were over prepared. Then, the roots were randomly divided into 8 groups, each group 15 roots. Groups 1 and 2 were used as controls. Root canals of group 3, 4 and 5 were obturated with Gutta-Percha/NanoHA, Gutta-Percha/NanoHA plus composite and Gutta-Percha/NanoHA plus MTA, respectively. Root canals of groups 6, 7 and 8 were obturated with Resilon/Epiphanyup 6), Resilon/Epiphany plus composite (group7) and Resilon/Epiphany plus MTA (group 8), respectively. Fracture resistance of each group was measured using the Instron machine.Three samples from each group had the depth of their fracture line measured by Micro CT Scan, and 2 samples from each group had their fracture pattern illustrated using SEM.

Results The highest fracture resistance was observed in Group +ve, followed by Groups 3, 6, 5, 2, 4, 1, and Group -ve, with values (in N) of: 1598 (641.0), 1190.5(424.2), 1164.7 (489.4), 821.2 (220.9), 683.4(179), 658.4 (211.3), 658.4 (99.0), 158.3(49.3), respectively. Statistical analysis using Kruskal-Wallis test showed that, the median of root fracture resistance showed highly significant difference between all experimental groups and P value = 0.001. Micro CT Scan and SEM showed that fracture pattern for MTA groups was wide vertical line; however once it crossed the MTA filling it was narrow and oblique whereas for composite groups was several cracks over the entire root surface. **Conclusions** MTA has the ability to reinforce thin walled roots and could replace the lost of radicular dentin which were mostly confined to the coronal part of the root. MTA has the ability to absorb or withstand the load as compared to composite, resilon, and gutta percha.

GE52

Incidence of microcracks in maxillary first premolars after instrumentation with four endodontic file systems. A comparative ex-vivo study Weissman A, Tsesis I Department of Endodontology, Tel Aviv University, Tel Aviv, Tel-Aviv, Israel

Aim Vertical root fractures (VRFs) may dramatically affect the long-term results of endodontic and restorative treatments. Micro-cracks in radicular dentin caused by rotary endodontic instrumentation, have been recently claimed to be a potential predisposing factor to VRFs. The aim of the study was to study the phenomenon of microcracks that might potentially be caused by mechanized instrumentation in first maxillary premolars.

Summary Intact extracted maxillary first premolars with two root canals were selected. None of the teeth had any externally visible microcracks when checked with small diameter light source under x20 magnification. Root canal mechanized instrumentation was performed with either the ProTaper file system, a WaveOne primary file or the Self-adjusting File (SAF). Teeth with intact roots and teeth that were treated with hand K files served as controls. The roots were then cut into segments and examined with an intensive small diameter light source that was applied diagonally to the entire periphery of the root slice, under x20 magnification; the presence of microcracks was recorded. Statistical analysis was performed using Pearson's Chi-square method, with 0.05 set as the significance level. Microcracks were found in 30% and 20% of the ProTaper and WaveOne treated roots, respectively. No microcracks were found in the SAF treated roots, while the intact control group and the hand file treated groups presented with cracks in 5% and 10% of the roots, respectively. The intensive small diameter light source revealed microcracks that could not be detected when using the microscope's light alone

Key Learning Points

 Mechanized root canal instrumentation with ProTaper and WaveOne in maxillary first premolars caused microcracks in the radicular dentin, while the use of the SAF file caused no such microcracks.
An intensive small diameter light source should be used

An intensive small diameter light source should be used

GE53

Resistance to cyclic fatigue of two different sized rotary nickel-titanium instruments in artificial canals

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Aim The aim of this study is to investigate the resistance to cyclic fatigue of two different sized rotary nickel-titanium instruments in the artificial canals with two different curvatures. **Methodology** The total sample consisted of 40 rotary endodontic nickel-titanium instruments (20 ProTaper F1 I 20 ProTaper F2) was divided into four groups . Ten samples of both type of instruments were tested in canals with smaller curvature (27 degree and 40 mm radius angle) and ten samples in the canals with grater curvature (35 degree and 13 mm radius angle) at a speed stated in the manufacturer instructions. Two artificial canals were fabricated in stainless steel blocks according to the curvature parameters chosen for this study. This canals were conical shape corresponding to the taper and the diameter of the studied Ni-Ti instruments. Rotation period of instruments in the artificial canal was 10 seconds, after which it was stopped and removed from the canal to cool down in the following 10 seconds. Than it was numerically noted in seconds by chronometar.

Results In contrast to canals with a larger degree of curvature (35°-13mm), the examined instruments in the canals with a smaller degree of curvature (27°-40mm) showed higher resistance

to cyclic fatigue. The greater resistance to cyclic fatigue in the canals of both degrees of curvature was shown by F1 instruments which had higher average number of cycles to fracture appearance. **Conclusions** The instrument with smaller dimension (F1) showed higher resistance to cyclic fatigue regardless of the curvature degree. The taper of instruments have influence on resistance of rotary NiTi instruments to cyclic fatigue, and instruments with grater taper have lower resistance to cyclic fatigue.

GE54

Impact of Experience on cyclic fatique of Revo-s Rotary instruments *ÖVSAY EO, Kazandağ Karapınar MK, Kaptan FK Department of Endodontics, Yeditepe University Faculty Of Dentistry, Istanbul, Turkey

Aim To evaluate the cyclic fatigue fracture resistance of engine-driven Revo-S instruments used by dental students, residents and endodontists.

Methodology A sample of 90 size 25, 0.08 taper Revo-S instruments used by students (n=30), residents (n=30) and endodontists (n=30) were tested. Each group were divided into 3 subgroups (n=10) to be tested in simulated canals with 60, 45, 90 angle of curvature and a 3 mm radius at a constant speed 350rpm and 0.8nm torque until they were fractured. The time of fracture for each instrument was recorded. The data was compared using one-way analysis of variance followed by Tukey's Honestly Significant Different test.

Results The instruments used by undergraduate students resulted in a significantly longer cyclic fatigue life (P < 0.0001) when compared the ones used by residents or endodontists. No difference of cyclic fatique was found between residents and endodontists

Conclusions The dental students caused less cyclic fatigue than residents and endoodntists. Multiple use of size 25, 0.08 taper Revo-S instruments maybe more favorable in undergraduate than residency or specialist clinics.

GE55

Effect of Protaper Universal, Self adjusting file, Twisted file adaptive and Reciproc rotary instrument on microcrack Formation in Dentin

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Aim To investigate the effect of instrumentation kinematics on incidence of microcracks in root dentin during root canal instrumentation with Twisted File adaptive (SybronEndo,Orange,CA) ,self-adjusting file(SAF) (ReDent-NovaLtd, Ra'anana, Israel),ProTaper Universal(PTU) (Dentsply Maillefer,Ballaigues, Switzerland) and Reciproc (VDW GbmH) rotary instruments.

Methodology One hundered – eight mandibular premolars were selected. Eighteen teeth were left unprepared and served as a control. The remaining ninety teeth were randomly divided five groups(n= 18). Group 1: TF Adaptive()instrumentation, group 2: SAF instrumentation, group 3: PTU instrumentation, group 4: reciproc instrumentation , group 5 Protaper Universal F2 file in reciprocating motion. After the root canal preparation all the roots were sectioned perpendicular to the long axis at 3,6 and 9 mm from the apex using a low-speed saw under water cooling, and the sections were observed under a stereomicroscope at a magnification of × 250.

Results No microcracks were observed in the control grup. Vertical root fractures were not observed in any of the groups. All of the instrumentation system used in this study created microcracks in the root dentin. In root prepared with PTU, Reciproc, SAF, F2 in Reciprocating motion and TFA, dentinal microcrack were observed in 13%, 9%, %8, %6 and %2 of teeth. In the present study, the occurrence of microcrack formations in the coronal thirds was %7.4, %3.7 in the middle thirds, and % 1.48 in the apical thirds. Fewer microcrack formations occurred in apical thirds than middle and coronal thirds.

Conclusions Within the limitations of this in vitro study all rotary file created microcracks in the root dentin, whereas the adaptive motion presented with satisfactory result with minimal dentinal microcracks.Least amount of cracks were observed in the canals instrumented with Protaper Universal files in rotary motion more cracks were observed in canals instrumented with Protaper in reciprocating motion. In the present study, although cracks were observed in all groups, cracks in the coronal region are more compared to cracks in apical region.

Acknowledgements The authors deny any conflicts of interest related to this study.

GE56 WITHDRAWN

GE57

Cyclic fatigue resistance analysis of different Nickel Titanium rotary instruments in simulated curve canals.

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Aim To evaluate cyclic fatigue of three rotary instrumentation systems in simulated curved canals. **Methodology** The cyclic fatigue test was performed in stainless steel artificial canals with a 2mm radius of curvature and angle of curvature of 35°. A total of 60 instruments was rotated until they fracture and number of cycles, minutes transcribed as well as millimeters fracture was recorded. A total of 20 HyFlex (Coltene) files, 20 Pro Taper Universal (Dentsply Maillefer) and 20 Twisted File (SybronEndo) all size 25/.06 was evaluated. All files were analyzed an optic microscope before the fatigue study to determine any defect on the surface of the instrument. During the test, friction was minimized by the use of lubricant oil, each file was operated continuously until fracture. All instruments were tested at 300 RPM at a torque of 2N and 2 ml of NaOCl 1% was used as well as EDTA 17% in order to simulate clinical conditions. The fracture and the aspect of tips and cross-sectional surface area. Data were analyzed in JMP version 10 performing Kruskal-Wallis analysis a significance level of p<0.05.

Results The observations by light microscopy showed the presence of micro-cracks less frequently in the Protaper Universal and HyFlex. The HyFlex file (152.95 cycles) had the highest fatigue resistance compared to the other instruments with statistically significant difference ($p \ge 0.05$). There was no statistical difference between Pro Taper Universal(27.30) and Twisted File(48.80). **Conclusions** Files HyFlex showed greater resistance to cyclic fatigue and require more time before breaking compared to Pro Taper Universal and Twisted Files.

GE58

Comparative study of the influence of chemical and thermal sterilization on TF adaptive and Protaper Next files

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Aim The sterilization of rotary files after use has known influences on fracture risk. The study objectives were: 1. Determine how sterilization influences on risk of fracture limes type M-Wire and phase R. 2. Establish what type of sterilization and what chemical material, affects more in the risk of fracture on files tipe M-Wire and phase R.

Methodology 80 files Next Protaper and 80 files TF Adaptive were selected and divided into groups. After use it in 160 palatal roots of maxillary molars, each group of files sterilized in a different way: 1. Sodium hypochlorite, 2. Quaternary ammonium, 3. Glutaraldehyde, 4. Heat sterilization, 5. Control group, 6. Sodium hypochlorite more heat sterilization, 7. Quaternary ammonium more heat sterilization, 8. Glutaraldehyd more heat sterilization. Once sterilized, were carried fracture using controlled forces.

GE59

Cyclic fatigue of NiTi Endowave rotary instruments used in OTR Motion Rovai RF¹, *Ambu AE², Campedelli CF³, Rimondini RR⁴, Silvestri SG⁵ ¹Private praticioner, Bastia Umbra (Pg), ²Department of Endodontics, Tuscan Dental School, University of Siena, Bologna, ³Private praticioner, Carpi (Mo), ⁴University of Bologna, Bologna, ⁵Private praticioner, Giano dell'Umbria (Pg), Italy

Aim Aim: to assess the cyclic fatigue of Endowave 25/06 instruments when used at 300 rpm either with a reciprocating motion, or a continuous rotation or the new OTR motion. Methodology Method: 30 NiTi Endowave 25/.06 instruments were randomly divided in three 10piece groups: G1 (continuous rotation group), G2 (Reciprocating CCW150°/CW30°) and G3 (OTR motion, rotating 90°CCW/90° CW). A simulator in stainless steel of the 300 series (Rockwell "C" scale < 32) was used with a plexiglass cover so as to see the file rotating. This test was performed with a simulated canal with 60° angle of curvature and a 3-mm radius. A lubricant was used to reduce friction (W lubricant No. 56; Whip Mix Corporation Luisville, Ky, USA). We used the Dentaport OTR motor with G1 and G3, in rotating and OTR mode, respectively, while we used the VDW motor with a 16:1 reduction handpiece with G2. Each file inserted as deep as 19 mm was rotated until fracture. Time was recorded with a chronometer to an accuracy of 0.1 s. Every value was recorded, then the statistical analysis was performed with a one-way ANOVA followed by Tukey's post-hoc HSD test. **Results** Results: G2 group turned out to be the most resistant to cyclic fatigue, while G1 was the least. No statistically significant differences were found between G2 and G3 groups, whereas the difference between them and G1 was (p<0.05).

Conclusions Conclusions: within the limits of this test, the OTR motion was associated with a higher resistance to cyclic fatigue of Endowave 25/.06 instruments as compared to them being used with a continuous rotation motion. No difference was found between the OTR and the reciprocating motion.

Acknowledgements We want to thank J Morita Europe for the supply of NiTi Instruments used for this research

GE60

Deformation and fracture of rotary instruments nickel-titanium protaper next after the clinical use *Fernández-Pazos G, Matín-Biedma B, Guerra-Caamaño M, Varela-Patiño P Master of Endodontics, University of Santiago de Compostela, Santiago de Compostela, Spain

Aim To evaluate the fracture and defects observed in Protaper Next (Dentsply, Maillefer) rotary instruments discarded after a normal clinical use.

Methodology Two hundred Protaper Next rotary instruments that were discarded after normal clinical usage over 9 months in the clinic of endodontics were collected. The instruments were discarded because of fracture and defects such as unwinding, curving or bending observed with the naked eye. The discarded file were grouped according to the file number (#17.04 to #50.06). All the files were 25-mm long. The length of the discarded files was measured from the shaft to the tip by using a digital caliper to determine if any fracture existed. Then, each file was inspected under a stereomicroscope (Leica MZ 16F) at different magnifications to see the defects. The fractured files

were examined longitudinally and categorized into torsional or flexural failure according to Sattapan et al.

Results The most frequently discarded files were X1 #17.04 (56 files, 28% of the sample); 20% of all discarded files showed defects. A chi-square test showed that the fracture and the deformation incidence depended on the size of the files (p<0.05). Moreover, Z test was applied to check the difference between the visible and non-visible defects (p<0.01). The most common defect was unwinding (12%). The highest rate of unwinding and fracture was observed in the #17.04 files. The reason for the separation of 11 (68.75%) files was flexural fatigue and for the other 5 (31.25%) was torsional fatigue.

Conclusions As a result of the relatively high incidence of deformation of the smaller files, these files should be considered as single-use instruments. Because cyclic fatigue was the main cause (68.75%) of the instruments' fracture, to reduce the risk of this type of fracture it is also important not exceeded the maximum number of uses recommended by the manufacturer.

GE61

Influence of different motions on cyclic fatigue of NiTi instruments *Putortì EA, Sannino G, Di Nardo D, Miccoli GM, Staffoli S, Valente Obino F, Testarelli L, Gambarini G Department of Endodontic, "Sapienza"- University of Rome, Roma, Italy

Aim To compare cyclic fatigue resistance of Twisted files (Sybron Endo, Glendora, Ca) instrument used with continuous rotation (TF) and with the Adaptive reciprocating motion (TFA). The null hypothesis is that there is no difference in fatigue resistance related to the different motions. **Methodology** 20 Twisted Files tip size 25 taper .06 nickel titanium instruments were randomly divided in two groups (n=10 each). Group 1 (TF) were used with continuous rotation (500rpm) while Group 2 (TFA) were used with Adaptive motion. The cyclic fatigue testing device used in the present study has been used for studies on cyclic fatigue resistance previously published. All instruments were rotated until fracture in artificial curved canals and time to fracture was recorded visually with a 1/100 second chronometer. All data were subjected to statistical evaluation with analysis of variance test.

Results Instruments used with TFA reciprocating motion showed a significant increase (p<0,05) in the time to failure when compared to continuous rotation. Mean time to failure was 129 (SD+/-23,3) sec for group 1 (TF), and 247 (SD+/-40,9,) sec for group B (TFA).

Conclusions Movement kinematic is among the factors which could affect lifespan of NiTi instrument because it determinate stress distribution which instrument accumulate during time. The results of present study clearly show that the new Adaptive reciprocating motion extended cyclic fatigue life of Twisted Files instruments when compared with continuous rotation.

GE62

Cyclic fatigue resistance of two endodontic reciprocating NiTi files with different alloys *Galván Olea G, Aranguren Cangas JM URJC, Madrid, Spain

Aim Analyze the resistance of the 25/8% Wave One I and 25/6% Wave One II files to cyclic fatigue fracture and determine the influence of thermal treatment in NiTi alloy (standard or without thermal treatment, M-Wire and Gold) on the instrument fracture.

Methodology A sample of 60 25/8% Wave One I and 60 25/6% Wave One II files with different alloys were tested. They were exposed to cyclic fatigue resistance by inserting them in a simulated stainless canal of 45°. The instruments were activated in reciprocating motion, at a constant speed (Wave One motor specifications). The handpiece was placed on a universal testing machine (Instron 3345). The files were activated until fracture occurred. The time to fracture, the flexibility and the maximum load were registered. Fracture resistance graphics were obtained from the universal

testing machine software. The data were statistically analysed using the one-way ANOVA test and the Tukey test.

Results Gold are significantly more flexible than M-Wire and NiTi standard in both groups (Wave One I and Wave One II). There are differences in resistance to cyclic fatigue fracture according to the alloy used (p<0.05). M-Wire and Gold are significantly more resistant than NiTi standard.

Conclusions Differences in the results between different alloys have been found. Gold decreases fracture rates in cycle fatigue in relation to M-Wire and NiTi standards.

GE63

The Effect of Regenerative Endodontic Treatment or Apexification Procedures on Fracture Resistance of Immature Teeth: an ex vivo study

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Aim The aim of this study was to evaluate the effects of clinical procedures used for MTA apexification or regenerative endodontic treatment on fracture resistance of immature roots Summary One hundred and eight intact mandibular single-rooted premolars were sectioned 2 mm above and 12 mm below the CEJ and then randomly divided into six groups (n = 18): a positive control (no canal enlargement), a negative control (without treatment), and four experimental groups that were treated either with (1) triple antibiotic paste (TAP) and a coronal MTA plug (TAP+cMTA), (2) calcium hydroxide and a coronal MTA plug (CH+cMTA), (3) CH and filled with an apical MTA plug and cold lateral compaction (CH+aMTA+GP), or (4) CH and completely filled with MTA (CH+fMTA). Compressive loading until fracture was used to measure fracture resistance. Data were analyzed by one-way analysis of variance and the Tukey post hoc test. -Fracture resistance of roots was significantly affected by the type of treatment (p < .001). The highest fracture resistance was found for the CH+fMTA group, although significantly lower than that of the positive control. The CH+fMTA group showed significantly higher fracture resistance than the TAP+cMTA and CH+cMTA groups (p < .001). However, no significant difference was found between the TAP+cMTA and CH+cMTA groups (p = .377). The lowest fracture resistance was found for the CH+aMTA+GP group. **Key Learning Points**

• -Within the limitations of the study, it can be concluded that the type of medicament had no significant effect on the fracture resistance of MTA coronally placed in immature teeth after a 2-week application.

• -MTA location and extent in the root canal

Preparation: Shaping ability

GE64

Comparative study of shaping ability of F360, Mtwo, i-Race and Hyflex systems with AutoCAD *Rubio Climent J, Zarzosa López JI, Pallarés Sabater A

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Aim Compare cutting area, maintenance of root canal anatomy and non-instrumented areas of F360, Mtwo, i-Race and Hyflex with size 35.

Summary Methodology: 120 teeth with straight root and a root canal into 4 groups, sectioned in coronal, middle and apical thirds. First group instrumented with F360, the second with Mtwo, the third with i-Race and the fourth with Hyflex. Analysis of area thirds and maintenance of root canal anatomy with AutoCAD 2013, and non-instrumented areas with stereoscopic microscope SMZ-2T. Levene's Test to compare variances and ANOVA Test to compare means. Results: As for the cutting area, equal variances to Levene's Test: 0.381 in coronal, 0.126 in middle, 0.509 in apical and 0.782 globally. ANOVA Test: P = 0.953 in coronal, P = 0.201 in middle, P = 0.159 in apical and P = 0.839
globally. Maintenance of root canal anatomy: 93.33%, 100%, 96.67% and 96.67% in coronal to F360, Mtwo, i-Race and Hyflex; in middle 90%, 96.67%, 93.33% and 96.67%; and in apical 100%, 100%, 96.67% and 100%. Non-instrumented areas: 13.33%, 3.33%, 3.33% and 10% in coronal to F360, Mtwo, i-Race and Hyflex; in middle 13.33%, 13.33%, 3.33% and 6.67%; and in apical 0%, 6.67%, 0% and 0%. Conclusions: Regarding the cutting area, no differences found in coronal, middle and apical thirds, and neither globally. About to maintenance of root canal anatomy, Mtwo was better in coronal third, in middle third were Hyflex and Mtwo, and in apical third were F360, Mtwo and Hyflex. Regarding non-instrumented areas, Mtwo and i-Race were better in coronal, in middle i-Race, and in apical F360, i-Race and Hyflex.

GE65

In Vitro Assessment of Force Generated by Different Novel Nickel-Titanium Rotary Systems *Eshaq A, Alsalman S, Foschi F, Mannocci F Department of Conservative Dentistry, King's College London Dental Institute, London, United Kingdom

Aim To compare in-vitro with a novel measuring testing device the force necessary to reach the apical portion of root canals in extracted human teeth, plastic teeth and resin blocks with the new ProTaper Next (PTN) files and other files including ProTaper Universal (PTU) and RaCe123. **Methodology** Sixty mesio-buccal canals of extracted human permanent maxillary first and second molars teeth, 60 mesio-buccal canals of "Dent-Alike" plastic teeth and 60 resin blocks were manually prepared, to the pre-determined working length, up to a size ISO 15 K-flexofile. The teeth and resin blocks were randomly assigned to three groups of 20 samples each (PTN, PTU and RaCe123). The teeth and blocks were mounted on one end of a miniature load-testing machine while the files/handpiece assemblies were mounted on the other. The canal preparation was undertaken at a pre-set velocity towards the apex, while the machine measured the apical force applied on the file. Maximum and average forces were calculated and statistically analysed using Kruskal-Wallis and Mann-Whitney-U test analyses of variance followed by the Bonferroni correction for multiple testing.

Results Statistically significant differences in the forces applied by the different filing systems were noted in the experimental groups, with the PTN files scoring the lowest average forces (with the concomitant highest peaks) when reaching the apical third and fourth quarters of the canal length, followed by RaCe123 and PTU (P<0.05).

Conclusions The results, within the limitations of this study, indicated that the PTN files required less apical force during root canal shaping to reach the apical portion of the canal compared with PTU and RaCe123 files.

GE66

Canal Transportation by Glide Path Preparation with Mtwo Files Followed by Self-Adjusting Files in Curved Canals of Maxillary Molars

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Aim To evaluate the impacts of glide path preparation with Mtwo instruments and subsequent SAF preparation on the transportation of the apical part of curved root canals.

Methodology Twenty four molar roots with an apical curvature of 20-30 degrees were selected. The working length (WL) was determined by subtracting 1 mm from the length measured by introducing a #10 K-file into the apical foramen. Mtwo #10/.04, #15/.05 and #20/.06 instruments were used to establish a glide path followed by SAF preparation. Digital radiography followed each step. AutoCAD

software was used to determine and compare the pre-operative central axis, the glide path and the SAF's post-preparation central axes. Superimposition of the images and AutoCAD tracings determined the extent of canal transportation at 0, 1, 2 and 3 mm from the WL.

Results The Mtwo glide path preparation resulted in a significant apical transportation of the canal axis toward the outer aspect of the curvature. The subsequent SAF preparation resulted in an insignificant transportation of the canal back to the inner side of the curvature. The overall transportation caused by the Mtwo glide path preparation followed by the SAF preparation resulted in a significant outward apical transportation of the canal axis.

Conclusions Transportation of the apical part of the canal was attributed entirely to the glide path preparation stage. The total transportation of the combined procedure was within the acceptable limits in the current literature.

GE67

In vitro study about the root canal deformation with diferents rotatory system: k3fx, mtwo, protaper next and hyflex.

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Aim To study the deformation angle comparing the systems, mtwo, k3fx,protaper next and hyflex. **Summary** Methodology: A total of 96 simulated resin canal root were prepared divided in 6 groups of 24 simulated resin canal root, using a set of files for each 6 simulated resin canal root,following the complete sequence as determined by the manufacture up to a diameter of 25. We applied constant irrigation with saline and ENDOVAC, it was prepared always by the same operator. Once enlarged they were sent to carry out a CBCT and the change of the curvature was measured by(or with) the computer. Descriptive statistics: the dataset the system that forms the biggest angle is mtwo and the smalest angel is k3xf. Relative to the number of uses the biggest change was produce between the 0use and the 1 use from each system. In hyflex the biggest change was produce between the 4^e number and the 5^e. Between 4 and 5 there was an icreased of 1,57%. Compatarative statistics: (anova method) there were significant variations between some of the systems.(p less than 0,05). The mtwo system presents the highest values and the differences with the other systems are significant. The second system with higher values was hyflex but without significant differences between itself and the other two systems. Between the k3 system and protaper next there aren't significant differences

Key Learning Points

• Every systems analyzed respct the root canal anatomy being the most conservative k3xf and the most constant protaper next.

• The introduction of the new technology m-wire makes that mtwo , until now the most anatomy conservative system becomes the one

GE68

Pathfinding Endodontic Instruments: Buckling Resistance in Calcified Canals Lopes HP1, *Neves MAS¹, Kill KB¹, Elias CN², Leal VTV³, Souza LC²

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Aim Exploration of the root canal is a very important step before preparation because it allows the clinician to negotiate the canal to its terminus and feel its complexity. Different instruments have been developed and proposed to specifically explore the root canal. This study compared the buckling resistance of endodontic pathfinding instruments in artificial canals of different depths.

Methodology The instruments tested were PathFile (Dentsply/Maillefer, Switzerland), Scout RaCe (FKG Dentaire, Switzerland), C-Pilot (VDW, Germany) and C+File (Dentsply/Maillefer). The former two instruments are made of nickel-titanium (NiTi) alloy, while the latter two are stainless-steel instruments. All instruments were size 10, except for PathFile (size 13). The buckling test used acrylic resin platforms that were flat or had artificial canals that were either 3-mm or 6-mm deep. The stainless-steel instruments were tested only against the flat surface, whereas NiTi instruments were tested in all platforms. Ten instruments of each brand were evaluated for buckling resistance by application of a load in axial direction using a Universal Testing Machine. The load required to generate a lateral displacement of the instrument of 1 mm was recorded and analysed for statistical significance.

Results On a flat surface, C+File showed greater buckling resistance followed by C-Pilot, PathFile and Scout RaCe. In 3-mm-deep canals, PathFile instruments showed similar buckling resistance to C-Pilot files on the flat surface. In 6-mm-deep canals, both NiTi instruments showed higher resistance to buckling when compared to the values obtained for stainless-steel instruments on the flat surface. **Conclusions** Findings indicate that the buckling resistance of NiTi pathfinding files increases with the depth of the canal. Therefore, it is advisable that stainless-steel instruments be used in the beginning of the exploration procedure until a certain depth in the canal (>3mm) is achieve. From this point on, NiTi pathfinding instruments can be used more safely.

GE69

Residual dentin thickness with three different instrumentation techniques evaluated by radiographic image analysis

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Aim To evaluate the impact of instrumentation between the ProTaper Universal, HERO Shaper and step-back technique using K-Files with regard to residual dentin thickness (RDT) ex vivo, via an image-analysis software.

Methodology The distal straight roots of 90 mandibular first molars that contained one root canal were selected. Three equal groups were formed randomly. Group A was treated with HERO Shaper (Blue Sequence) rotary files up to a 30.04 file, Group B was treated with ProTaper Universal up to F3 finishing file and Group C was treated with K-Files (step-back technique with master apical file ISO No 30). Digital radiographs were captured with both bucco-lingual and mesio-distal projections of the roots, before and after instrumentation. The radiographic images were examined using Viewbox, an image-analysis software, by 3 blinded but calibrated examiners for both projections with regard to the total root length and the apical 4 mm (two examination levels). The null hypothesis was that there was no statistical significant difference concerning the RDT regardless the instrumentation technique or the examination level.

Results After each procedure, the RDT was compared statistically with the original dentin wall thickness at an alpha level of 0.05. All analyses were performed using Stata 10.1. The difference in dentin thickness before and after root canal preparation was significant (p< 0.001) for both observation projections and examination levels, regardless of the instrumentation technique. There were no statistically significant differences between the 3 groups concerning the RDT for either observation view or examination level.

Conclusions Root canal instrumentation with ProTaper Universal, Hero Shaper and K-Files had statistically similar impact on RDT, probably because an adequate tapered shape was obtained in all cases. The null hypothesis was confirmed.

A comparison of the cleaning and shaping efficacy of single or multiple-file rotary systems: a microcomputed tomography study

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Aim To compare the cleaning and shaping efficiency of single or multiple file systems in mandibular first-molars using high-resolution micro-computed tomography (MCT).

Summary Twenty mesial roots of extracted mandibular first-molars with an angle of curvature of 25–35° and 20 distal roots were scanned before and after instrumentation using MCT with a spatialresolution of 21-µm to measure volume, surface area changes and canal transportation. Teeth were randomly assigned to 2 experimental groups according to the preparation technique (Self-Adjusting-File [SAF, ReDent-Nova, Ra'anana], ProTaper Universal [PTU, Dentsply Maillefer]). The samples of Group1 were instrumented using PTU. The final instruments used for mesial canals (n=20) were #F3 and for distal canals (n=10) were #F4. Working-time was managed with digital chronometer including irrigation and file changing times. The samples of Group2 (n=30) were prepared with the 1.5-mm diameter SAF which was operated with constant-irrigation in a light-pecking, trans-line motion. 2D-cross-sectional images were transformed into 3D-models using appropriate software and untouched-areas were calculated on the images reconstructed. The changes in canal volume; surface area and transportation were calculated and analyzed using the one-way analysis of variance (P=0.05). PTU removed a significantly higher amount of dentin in mesial-canals (P< 0.05). There was no significant difference between the groups in distal canals according to the surface-area and volume changes. Both systems showed transportation in all thirds of the canals and no significant difference was observed (P>0,05). Although, the amount of untreated surface area in mesial canals was lower in group instrumented with PTU, contrary no statistically significant difference was found between two systems according to the data obtained from distal canals. A correlation between working-time and the canal-curvature was also observed in mesial canals for both groups.

Key Learning Points

• In this laboratory-study, both systems were not capable of completely preparing the root canals. However, PTU shaping performance was better in terms of surface area and volume changes. On the other hand, the mesial canals of mandibular molars were more

GE71

Micro-tomographic characterisation of Pro-Taper enlarged acrylic blocks and human teeth *Juhász A¹, Dobó-Nagy CS², Márton I¹, Hegedűs CS³

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Aim The objective of this study was to micro-tomographically image and characterise the change in morphology of straight and curved acrylic blocks and human tooth root canals subjected to ProTaper rotary enlargement, and to introduce a novel metric for quantifying change in root canal morphology.

Methodology Six-six extracted human teeth and acrylic blocks with both straight and curved canals were scanned with an X-ray microfocus computed tomography pre- and post-canal shaping using a ProTaper F1 and F2 rotary instruments, enabling three-dimensional digital reconstruction and quantitative gauging of relevant instrumental parameters and changes therein (surface area and volume, and SMI). Canal geometry change and the effects of shaping were characterised with surface area change/volume change ratio $\Delta A/\Delta V$. The comparison were performed amongst straight(S) and curved(C) acrylic(a) and human(h) teeth in ProTaper F1 and F2 groups.

Results SMI changes in acrylic block: There was an only statistically significant difference between the aSF1 and aCF2 groups (p=0.008). SMI changes in human groups: There were no statistically significant differences amongst hSF1, hSF2, hCF1 and hCF2 groups. $\Delta A/\Delta V$ values: There is an extremely significant difference between the hSF2 and aSF2 groups (p<0.001). There is statistically significant difference (p= 0.240) between hGF2 and aGF2 groups.

Conclusions Instrumentation-induced canal geometry change was determined to be more pronounced in straight canals using the novel parameter $\Delta A/\Delta V$ when it assessed by mCT. This has been proved to be a statistically accurate and reproducible metric for quantitative characterisation between straight and curved root canals.

GE72

Effectiveness of 4 NiTi rotary Path-file instruments on the creation of glide path in moderate curved molars

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Aim The present study evaluated the effectiveness of 4 NiTi rotary instruments (MTwo 10.04, ScoutRace 10.02, ProDesign 25.01 and ProGlider) in reaching the working length (WL) – glidepath procedure - in moderate curved molars.

Methodology Two hundred and forty maxillary and mandibular molars with moderate curvature were selected. The sample was randomly assigned into one of the 4 experimental groups (n = 60; 30 maxillary and 30 mandibular molars) according to the tested instrument: MTwo 10.04 (VDW GmbH, München, Germany), ScoutRace 10.02 (FKG Dentaire Swiss Dental Products, La Chaux-de-Fonds, Switzerland), ProDesign 25.01 (Easy Equipamentos Odontólogicos, Minas Gerais, Brazil), and ProGlider (Dentsply Maillefer, Ballaigues, Switzerland). After root canal access, an ISO size 8 K-file was passively inserted up to the coronal third to determine canal angle direction. Glide path preparation was performed by an endodontist using the above-mentioned files. Each instrument was used twice and then discarded. Each tooth was classified as "reached the WL" or "not reached the WL" and instrument separation was also recorded.

Results The WL was reached in frequency of 68.3%, 58.3%, 51.6% and 38.3% of ScoutRace, MTwo, ProGlider and ProDesign, respectively. Separation rates were 6.7% to ScoutRace and ProDesign, 16.7% to MTwo, and 23.3% to ProGlider.

Conclusions ScoutRace 10.02 was the most effective and safe path-file instrument on the creation of glide path. ProGlider showed the highest separation rates.

GE73

Centering ability of three NiTi files with a single step versus three step shaping procedure. *Moukarzel Maria DDS², Walid Nehmé DESE²

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Aim To evaluate the centering ability of Reciproc[®] (VDW), Wave One[®] (Dentsply, Maillefer) and the Shaper in a new Micro Mega NiTi solution, using two shaping techniques. (One step versus three step crown down)

Methodology 90 resin blocks (Maillfer, Dentsply) were divided into three groups of 30. The first group was negotiated with Reciproc[®], the second with Wave One[®] and third with the MM Shaper. Each group was divided into two subgroups of 15 blocks each : in the first sub-group each third was prepared separately from coronal, to apical. In the second sub group the blocs were shaped in a single step directly to the apical third . Pictures of the blocs were taken before and after shaping

and superimposed in the digital program Photoshop. For each bloc, 15 sections at 0.5mm respectively were drawn away from the foramen, using the AutoCad program. For each section, two measurements were taken in the direction of the curvature and in the opposite direction .The total of 2700 Values were collected and analyzed with an ANOVA, a paired student test and a Fischer's test with an alpha risk fixed at 5%.

Results The Fisher test showed a significant difference for all the blocks before and after shaping in both techniques (p<0, 0001) and Uniti was proved to be the most conservative when compared to other instruments(p<0,0001); Comparing the two shaping techniques , results of Reciproc and UNiti showed significant difference when the instrument was used three times in the

canal(p<0,0001):more resin was removed and the canal was more enlarged;The Student Test confirmed these observations.Whereas results of the two tests for Wave One showed no significant difference between the two subgroups (p>0,0001):the same amount of resin was removed in both cases.

Conclusions The three instruments enlarge the canal in both shaping techniques but Reciproc and UNiti can be more conservative if used only one time in the canal;Continuous rotation for UNiti files showed to be more conservative than reciprocation increasing the centering ability of these instruments.

GE74

An in vitro comparative study of lateral cutting efficiency of reciprocating instruments *Reggio L¹, Anglesio Farina G¹, Giansiracusa Rubini A², Plotino G², Testarelli L², Gambarini G², Di Giorgio F³

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Aim The aim of the present study was to evaluate the lateral cutting efficiency of two reciprocating instruments, Twisted File Adaptive (TF Adaptive) and WaveOne Primary. **Methods** 10 new TF Adaptive (SybronEndo, Glendora, CA, USA) size ML1 (08.25) and 10 new WaveOne Primary files (Dentsply Maillefer, Ballaigues, Switzerland) were activated using reciprocating motors, respectively TFA Elements motor (SybronEndo, Glendora, CA, USA) and Silver motor (VDW, Munich, Germany). The device used for the cutting test consisted on a mainframe to which a mobile plastic support for the hand-piece is connected and a stainless-steel block containing a Plexiglas block against which the cutting efficiency of the instruments was tested. The length of the block cut in 1 minute was measured in a computerized program with a precision of 0.1 mm. Mean and standard deviations of each group were calculated and data were statistically analyzed with one-way ANOVA and Bonferroni t test (P < 0.05).

Results TF Adaptive displayed significantly greater maximum penetration depth than WaveOne Primary (P < 0.05). More precisely.TF Adaptive instruments cut the Plexiglas block to a mean depth of 8.7 mm (Standard Deviation - SD = 0.5 mm), while WaveOne Primary instruments cut the Plexiglas block to a mean depth of 6.4 mm (SD = 0.3 mm).

Conclusions TF Adaptive instruments showed greater lateral cutting efficiency than WaveOne instruments, which could be related both to different cross-sectional designs and motions.

GE75

Comparative analysis of two instrument cleaning foams used with reciprocating instrumentation *Gluvč M, Fidler A

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Aim To compare two instrument cleaning foams during root canal instrumentation with reciprocating single-file system.

Methodology Thirty extracted mandibular incisors with mature apices and straight root canal were decoronated to standardize working length to 16 mm. A 2mm deep standardized access cavity was prepared with Gates-Glidden bur No. 2 and root canal patency was confirmed with K file #10. The teeth were randomly divided in two groups (n=15) regarding the foam used for instrument cleaning during instrumentation. Clean Stand (Dentsply Maillefer , Ballaigues, Switzerland) with dry foam (CSD) was used in the first group, while Endofoam PVP (ADM, Brisbane, Australia) soaked with 2.5 % sodium hypochlorite (EFW) was used in the second group. All root canals were instrumented using Reciproc R25 instruments and Reciproc Silver endodontic motor (VDW, Munich, Germany). Access cavity was filled with irrigant (2.5 % sodium hypochlorite) and canals were instrumented according to the manufacturer's instructions by slow in and out pecking motion. After three pecking motions canal was irrigated and instrument was with cleaned in foam cleaner with three in and out strokes. Before and after cleaning a video sequence of continuously rotating instrument was captured allowing the instruments to be subsequently analysed from four sides. Amount of remaining debris in each flute was evaluated and scored as: (0) no debris visible; (1) isolated spots of debris; (2) covered with loose debris (3) filled with loose debris and (4) filled with hard packed debris. Amount of debris in instrument was calculated as percentage of maximum score. A t-test was used to compare amount of debris between both groups before and after cleaning.

Results Before cleaning, the average amount of debris in CSD and EFW group was 63.3% and 68.5%, respectively and no significant difference was found (p=0.07). After cleaning, the average amount of debris in CSD and EFW group was 7.7% and 3.4%, respectively and significant difference was found (p<0.001).

Conclusions Reciprocating instrument cleaning with soaked Endofoam resulted less than half residual debris compared to dry Clean Stand Sponge.

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GE76

Ledge position in relation to canal path: a microCT study. *Roggia A1 Roccuzzo A, Pasqualini D, Alovisi M, Scotti N, Berutti E Surgical Sciences, Endodontics, University of Turin Dental School, Turin, Italy

Aim Ledge formation is a common complication during access cavity, canal scouting, glide path and instrumentation with an incidence ranging between 10-52%. X-ray computed micro-tomography (micro-CT) was used acquire pre- and post-instrumentation matched volumes to evaluate the most frequent range of location of ledges in relation to canal path.

Methodology Extracted mandibular first permanent molars were selected. Canal patency with a #10 K-file was checked. Ledges were created with stainless steel K-files up to #50. Molars were scanned with a micro-focus cone-beam geometry system. A total of 2400 projections through 360° were acquired at 100 kVp, 80 μ A, pixel size 8 μ m. Ledge position was identified on a sagittal cross-section and axial slice at ledge level was acquired. Ledge centroid (L) coordinates on x and y axis were registered. Canal centroid (C) was identified 1 mm apical to ledge level. An L-C inter-point vector was identified. The internal angle formed by the vector and the line joining MB and ML canals was considered to indicate the root canal position in relation to ledge position. A descriptive range of frequency of location was calculated on axial slices.

Results The root canal was most frequently located in the 45±20 degrees angle range from MB-ML line.

Conclusions The root canal was most frequently located in the 45±20 degrees angle range from MB-ML line.

GE77

Comparison of the shaping effect of two rotary instruments on root canal morphology: a radiographic evaluation

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Aim The aim of this study was to evaluate the effects of Reciproc and SafeSiders systems on root canal curvatures by using phosphor plate imaging system.

Methodology The 20 mesial root canals of extracted mandibular molars ,with moderate root canal curvatures and two separate mesial canals and separate foramina(Weine type IV morphology) were chosen radiographically.#15 H files were inserted to canals to demonstrate curvature angles and initial digital radiographs of root canals were taken from buccolingual (clinical) and mesiodistal (proximal) views. Curvature angles were measured by using Schineider's technique.Root Canals were divided into two experimental group (n=10).In group 1 root canals were prepared with Reciproc and in group 2 root canals were prepared with SafeSider instruments in accordance to the manufacturer's instructions. Post-instrumentation images were taken under similar conditions with initial digital radiographs.The pre- and post-instrumentation images of the root canals in clinical view(CV) and proximal view (PV) were transferred to PicPick programme (Turkey). Statistically, paired and unpaired t tests were used (p≤0.05 .

Results Statistical analysis revealed that straightening of root canal curvature was significantly greater in proximal view of both groups (p=0.001 and p=0.002).

Conclusions Statistical analysis revealed that a significant difference was not observed but more straightining on curvature angle was noticed after Reciproc preparation , so it is concluded that reciproc demonstrated significantly more canal straightening and makes more agressive preparation from SafeSiders.

GE78

Wide Apical Preparation of Curved Root Canals; An Ex Vivo Comparison of the Root Canal Axis following LightSpeed LSX System vs. a Hybrid Technique

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Aim Root canal anatomy may call for wide apical preparation. This study sought to compare curved root canal straightening and apical transportation following wide preparation to size #55 using LightSpeed LSX system (LSX) vs. a hybrid technique utilizing ProTaper Universal rotary (PTU) instruments followed by NitiFlex (NF) hand files.

Methodology Thirty-two mandibular molar mesial roots, with a curvature of 20-30 degrees, in which a size #20 LSX instrument was the first file to bind at the working length, were selected. The roots were randomly divided into two groups. In group 1, the canals were prepared with LSX instruments up to size #55. In group 2, the canals were prepared with PTU instruments up to F2 file (25/.08) followed by NF files up to size #55. The canal angles, radiuses of curvatures and apical transportation were calculated. The pre-operative radiographs of the canal central axis served as the control. **Results** Following the root canal preparations to size #25, both preparation techniques maintained the original canal axis with no significant differences between them. (P>0.05). Further apical enlargement up to size #55 using NF files resulted in significant apical transportation and root canal straightening opposing the apical enlargement to the same size using LSX (P<0.05).

Conclusions Within the limitations of this study, it could be concluded that when a large apical preparation is indicated in curved canals, non-tapered instruments preserve the root canal axis more effectively than does a hybrid technique utilizing a tapered rotary system followed by NiTi hand files.

Shaping ability of single file-techniques vs. multiple-instrument rotary system in simulated curved canals

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Aim The aim of this study was to compare shaping ability of three different single file-techniques (Reciproc, WaveOne, and OneShape) with multiple-instrument rotary system (i-Race) in simulated canals with L and S-shaped curvatures.

Methodology Eighty simulated canal blocks (40 L-shaped, 40 S-shaped curvature) were instrumented using Reciproc, WaveOne, OneShape, and i-Race rotary systems. Pre and post instrumentation images were superimposed and assessment of canal shape was performed with image analysis software. The width of the resin removed from the inner and outer aspects of the simulated canals and canal transportation were measured. Data were analyzed using ANOVA and Tukey's Post Hoc test.

Results Single-file technique, particulary, Reciproc significantly transported the canal toward the outer surface at the apical levels and toward the inner surface of the canal at the middle part; it transported the canal curvature more than the other two single-files (WaveOne, OneShape). i-Race system revealed significantly less canal transportation at different levels of both L and S-shaped canals.

Conclusions Multiple-file system (i-Race) seems to maintain the canal curvature in preparing either L or S-shaped canals compared to single-file techniques (Reciproc, WaveOne, OneShape).

FRIDAY, SEPTEMBER 18th

Filling: Leakage

GE80

Comparison of apical leakage between canals filled with thermafil and real-seal 1 *Andres Hernando C, Garcia Manjon A, Rodriguez Arrevola N, Juarez Navarro I, Romero Lozano B Department of Endodontics, Intitucion Universitaria Mississippi (Universidad De Alcala), Madrid, Spain

Aim To evaluate the percentage of leakage in the apical third of canals of human extracted teeth obturated with Thermafil (Dentsply, Maillefer) versus RealSeal1(SybronEndo) with diafanization technique.

Methodology 45 human uniradicular extracted teeth were selected with only one canal. They were kept in saline solution and were cut off beneath the cementoenamel junction. WL was determined with a K flexofile #15 passing the apical foramen and then 1mm was dedutcted. The canal preparation was made with Protaper (Dentsply, Maillefer) until F2file. NaOCI 5,25% was used to rinse between the files and the last irrigation was with EDTA and followed by a last rinse with saline. The canals were dried with paper points #30. The roots were randomly divided into 2 experimental groups of 20 sample units each and 1 control group (positive) of 5 sample units, distributed as follows:

Group I: 20 teeth obturated with Thermafil, apical diameter 30.04 with AhPlus Sealer manipulated in accordance with the manufacturer's instructions using the Thermaprep oven.

Group II: 20 teeth obturated with RealSeal1, apical diameter 30.04 with sealer RS1 manipulated in accordance with the manufacturer's instructions using the RS1 oven.

Group III: 5 teeth (positive control group) were not obturated.

After completed setting time in accordance with manufacturer's instructions teeth were kept in saline solution. The 3 groups were then covered with 2 layers of nail varnish except for the last 5mm of the apical third. In the cervical area the teeth were covered with wax. Once they were dry the layers of nail varnish was removed with a scalpel number 15 and immersed in indian ink (Faber Castell, Stein, Germany) 48 hours. Then we started the diafanization technique protocol and observed the results with 4.5x lens and took photographs.

Results Comparative statistical analysis: Z-test was used. Descritive statitical analysis: Excel graphs used. Global leakage: RealSeal1: 75% leakage vs. Thermafil: 45%, 1 mm from apex: Leakage: RealSeal1: 5% vs. Thermafil: 25%, 3 mm : Leakage: RealSeal1: 50% vs. Thermafil: 20%, 5 mm: Leakage: RealSeal1: 20% vs. Thermafil: 0%

Conclusions Study showed apical leakage using RealSeal1 is higher than Thermafil except 1mm from apex that Thermafil was higher

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GE81

Coronal Microleakage of Three Dental Biomaterials as Intra-Orifice Barrier in Nonvital Bleaching *Ramazani M

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Aim Respecting the fact that root canal therapy is main etiology for iatrogenic tooth discoloration, the aim is to assess microleakage of Glass ionomer cement (GIC), Mineral Trioxide Aggregate (MTA), and Calcium Enriched Mixture (CEM) cement as orifice barrier during walking bleaching.

Methodology Seventy extracted human incisors were divided into three experimental (n=20) and two control groups (n=5) after root canal therapy. Three cements were applied as intra-orifice barrier in test groups and bleaching was conducted using sodium perborate powder mixed with distilled water, for nine days. Bovine serum albumin marker was traced in a dual-chamber technique with Bradford indicator to evaluate leakage. Kruskal-Wallis and Man-Whitney were statistical tests with 0.05 as significance.

Results Mean microleakage of GIC, MTA, and CEM cement groups were 0.47±0.02, 0.48±0.02 and 49±0.02, respectively. Statistical analysis showed no significant difference between three experimental groups (P>0.05).

Conclusions Within the limitation of the present in vitro study, the sealing ability of CEM cement as an intra-orifice barrier was comparable with GIC and MTA.

GE82

Comparative study of the ability to fill lateral canals of four canal sealers: MTA Fillapex, Top Seal, Gutta-Flow, Pulp Canal Sealer.

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Aim Evaluation and comparison of the behaviour of a novel canal sealer, i.e. MTA Fillapex, and three different canal sealers: Top Seal, Gutta-Flow and Pulp Canal Sealer; when filling simulated lateral canals. The homogeneity used for obturating the root canals, the apical seal and the leakage of the filled simulated lateral canals are also compared for the previously mentioned canal sealers. **Summary** A total of 100 extracted human single rooted teeth with fully formed apices were selected for this study. Teeth were de-coronated, and roots were standardized to a working length of 16 mm. Root canal preparation was carried out with Hedstroem files until #20 previously and rotary Protaper Universal file system in all groups. The specimens were then randomly divided into 4 groups A, B, C and D (n = 20), and the control group. Subsequently, the teeth were diaphanized and simulated lateral canals were made at 2, 4, and 6 mm from the root apex. Finally, the teeth were obturated with the lateral condensation technique, using a different canal sealer for each group (A: MTA Fillapex \mathbb{P} ; B: Top Seal \mathbb{P} ; C: Gutta-Flow \mathbb{P} ; D: Pulp Canal Sealer \mathbb{P})

GE83

Microleakage of gutta percha and Resilon after two post space preparation lengths *Wimonchit S^1 , Chalermnontagarn R^2

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Aim The purpose of this study was to compare the efficacy of two types of root canal filling, gutta percha and Resilon, to preserve apical seal after two post space preparation lengths. **Methodology** Twenty eight single-rooted teeth were chosen and decoronated to obtain 14 mm long roots. They were prepared by means of step back technique using K-flex file and gate glidden drill. Apical enlargement was performed to #60 file while the coronal orifice was controlled to diameter of 2 mm,combined with 2.6% NaOCI irrigation. All roots were randomly assigned into two experimental groups of 12 each and two controlled group of 2 each. Group I (n=12) and Group II (n=12) were obturated with Resilon/RealSeal and gutta percha/ZOE sealer, respectively. The remaining was allocated for positive (n=2)and negative control (n=2). All specimens were stored in 100% humidity at 37°C for 7 days. The post space preparation in both groups was created utilizing heated pluggers, and leaving a 5.0 mm root canal filling. All teeth were subjected to fluid filtration analysis to measure volume of fluid flow rate. After that 2 mm root canal filling was subsequently removed in the same specimen. The specimens were remeasured fluid flow rate in the same manner. Data was analyzed statistically using repeated analysis of variance.

Results The maximum and minimum value were found in group I with 9 mm post space and group II with 11 mm post space, respectively. From statistical analysis, the fluid flow rate increased statistically significant (p<0.05) according to the length of post space. However, the group obturated with Resilon/RealSeal showed significantly lower fluid flow rate than the group obturated with gutta percha/ZOE sealer, irrespective of post space preparation length.

Conclusions Based on the results of this study, Resilon should be material of choice in case of tooth with minimal root canal filling after post space preparation.

Filling: MTA

GE84

Apical sealing ability of mineral trioxide aggregate root canal sealer *Endang Suprastiwi ES, Fransilla Poedyaningrum FP, Munyati Usman MU Department of Conservative dentistry, Universitas Indonesia, Jakarta, Indonesia

Aim Despite the excellence properties of mineral trioxide aggregate (MTA), it may have some influence in its sealing ability. The purpose of this study was to analyze the occurrence of apical sealing ability in root canal filling using MTA sealer.

Methodology Thirty-two extracted human lower premolars teeth had their canals prepared and filled with ProTaper. Divided into two groups, group 1 is filled canals by using guttaperca and MTA sealer (MTAS) and Group 2 root canals were filled using guttaperca and resin epoxy sealer (RES) which is used as a comparison group. All samples incubated at a temperature of 370C for 24 hours with 100% humidity. Then the whole sample is immersed in India ink for 7 days. Samples were washed and decalcified until transparent. India ink penetration depth is evaluated by using a stereo microscope by scoring. Score 1: 0-0.5 mm ink penetration, a score 2: ink penetration 0.51- 1mm, and a score 3: ink penetration > 1 mm.

Results score 1 in the group RES 37.5%, while 21.9% MTAS group. Data were analyzed using ANOVA SPSS 17 at 5% significance level. Statistical analysis between the two groups showed no significant difference.

Conclusions the apical sealing ability of MTA sealer showed the same level with epoxy resin sealer

GE85

Bioactivity evaluation of Mineral Trioxide Aggregate and EndoSequence Bioceramic Root Repair Materials

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Aim EndoSequence Root Repair Material (ERRM) (Brasseler USA, Savannah, GA) is a calcium phosphate silicate material with a bioceramic component. Unlike MTA, it comes premixed in a ready-to-use container. ERRM overcomes the basic handling difficulties associated with MTA. The aim of this study was to compare the bioactivity of MTA and ERRM.

Methodology MC3T3-E1 cells were cultured in recommended culture conditions and exposed to the test materials. The cell viability was evaluated by XTT assay. The expressions of alkaline phosphatase (ALP), osteocalcin (OC) and bone sialoprotein (BSP) at gene level were detected by RT-PCR and real-time PCR. Osteogenic differentiation and mineralization were measured by ALP staining and alizarin red S staining. One-way analysis of variance followed by Tukey's Post Hoc test was used to determine any statistically significant differences according to the test materials with the use of SPSS 18.0 software program (SPSS, Chicago, IL). Differences were considered significant at p < .05. **Results** Cell viability of ERRM in dilutions of 1, 1/2 and 1/4 was lower than MTA (p < .05). There was no statistically significant difference in cell viability between materials in dilutions of 1/10 (p < .05). The mRNA level of osteogenic genes increased significantly in MTA and ERRM group compared to

the control (p < .05). MTA, and ERRM led to an increase in ALP staining and alizarin red S staining compared to the control.

Conclusions ERRM had similar biological activity when compared with ProRoot MTA, suggesting that ERRM can be desirable alternative to MTA for root-end filling material.

GE86

Direct pulp capping with a nanostructural biomaterial based on an active calcium silicate system *Opacic-Galic V¹, Petrovic V¹, Sopta J², Kovacevic R², Zivkovic S¹

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Aim To evaluate biocompatibility and bio functionality of a newly synthetized nanomaterial after capping the exposed dental pulps of rabbits.

Methodology The tested material is a calcium silicate system (CS), a composition of β -C2S and C3S phase with the addition of dehydrated plaster and barium sulphate as an X-ray contrast agent. The calcium silicate system is arranged in agglomerates which are made of particles (117-147 nm) and even smaller crystallites (19.9 nm). The control material was mineral trioxide aggregate (MTA). Animal model used in this study included 4 rabbits. The exposed pulps in labial cavities of the teeth were capped with tested materials and closed with glass-ionomer cement. The animals were sacrificed after 10 and 14 days. Histological evaluation was based on the inflammatory response of the pulp and the formation of the dentinal bridge.

Results All samples with MTA showed signs of mild to moderate inflammation with inflammatory and few giant cells next to the implanted material. Samples with CS showed absence of inflammation or it was rated as mild, with less than 10 inflammatory cells per field. In this short observation period, none of the samples exhibited dentin bridge formation around the area of the exposed pulp. There was a very thin lateral deposition of a newly formed calcified tissue (up to 149µm) in the maxillary incisor, 10 days after capping with MTA. A very thin layer of newly formed calcified tissue, with regular structure that resembled reparative dentin was observed in samples with CS. Mesenchymal cells with odontoblast differentiation were observed on the outskirts. **Conclusions** The new calcified tissue with a more regular structure (osteodentine), formed in contact with the pulp capping material confirmed the biofuncionality of the CS, in vivo.



Nonsurgical Endodontic Retreatment of External Apical Root Resorption Using Mineral Trioxide Aggregate: A Case Report

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Aim

This case report aimed to demonstrate the nonsurgical endodontic retreatment of a mandibular first molar associated with a severe external apical root resorption using mineral trioxide aggregate (MTA).

Introduction

Root resorption is the loss of dental hard tissue as a result of clastic activities (1). Early diagnosis is the key factor to detect and preserve the involved tooth. Root resorption usually does not represent with any clinical sign or symptom (2). Hence, the diagnosis is generally based on its detection during radiographic examinations (3).

Case Presentation

A 19-year-old female patient referred with an endodontically treated mandibular first molar tooth with complaint of pain and sinus tract. The tooth demonstrated tenderness to percussion. Radiographic examination revealed a periradicular lesion involving pathologic resorption of the apical region of the distal root (Figs. 1 and 2). The root canal fillings were removed from the canals and Ca(OH)2 paste was placed for 2 weeks. When the tooth was asymptomatic, the mesial roots were obturated with gutta-percha and resin-based sealer. The distal canal was obturated with white-MTA and wet cotton was placed for 48 hours. The tooth was restored with amalgam restoration.



Figure 1



Figure 2



Figure 3

Discussion

External apical resorption was successfully treated by using of MTA in this case. By using single cone obturation technique and MTA obturation, a modified method was successfully used according to the situation of this case. MTA could be considered as a superior material to be successfully used in the non-surgical treatment of external root resorption. CBCT is very useful for evaluating the true nature and severity of absorption lesions in root resorption.

Conclusions and Clinical Relevance

The patient was recalled for 1, 6, and 12 months follow-ups. In this period the tooth was symptom free and radiographical examination revealed the healing of the apical region (Fig. 3).

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Root/furcal perforation repaired with MTA cement. A case-series/retrospective study. *Toto S, Iacono F, Zamparini F, Lolli L, Chersoni S, Pirani C, Gandolfi MG, Prati C Department of Biomedical and Neuromotor Sciences, University of Bologna, Bologna, Italy

Aim This case-series retrospective study investigated the clinical success rate of endodontically treated teeth presenting root or furcal perforation and repaired with hydraulic MTA cement. All patients were treated by postgraduate students attending a Master in Endodontics. **Methodology** Twenty-one endodontically treated teeth (n=20 patients) were initially classified on the basis of radiographic presence/absence of periapical healing, presence/absence of periodontal defects and other clinical data such as location, size and cause of perforation. Presence of vital/necrotic pulp or presence of previous endodontic treatment was also reported. The final outcome measure was the presence/absence and the size of radiolucency around the perforation (RAP). Perforations were filled in all cases with Tech Biosealer Root-end (Isasan, ITALY) according with the manufacturer instructions. All teeth were restored in composite after the endodontic treatment. A follow-up of 12 months was performed. The outcome at 6 months was correlated with the outcome at 1 year. Extraction data were recorded.

Results After one year 6 teeth presented RAP > 3 mm and 4 were associated by clinical symptoms and extracted.

Conclusions Treatment of root/furcal perforations is a high risk therapy despite the use of hydraulic and bioactive materials such as calcium silicate-based cement. The appearance of bone defect in correspondence of perforation is an index of infection and could represent a key factor for the outcome of root perforation repairing therapy.

GE89

Potential of X-ray fluorescence analysis of some MTA-based endodontic repair cements Suciu I¹, Dimitriu BA¹, Amza OE¹, Vârlan C², *Moldoveanu GF¹, Constantinescu B³, Stan D³, Preoteasa EA³

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Aim Mineral trioxide aggregate (MTA)-based endodontic repair materials are already studied by upto-date physical methods. The authors evaluated the potential of X-ray fluorescence (XRF) for the study of these materials. XRF is a simple, multielemental, nondestructive and sensitive atomic method of analysis. XRF detects elements from K to U, with few exceptions, and may be performed by portable instruments, covering concentrations from hundredths to tens of percent. XRF has not been previously used to analyze endodontic repair materials.

Methodology Four MTA endodontic repair materials were analyzed: ProRoot[™]MTA (Dentsply), MTA-Angelus (Angelus), MTA Plus (Avalon Biomed Inc.) and Biodentine (Septodont). Flat discs were prepared on glass plates; the materials were adherent and brittle after setting. Two portable EDX-XRF spectrometers with Rh and Ag anodes were used.

Results In all materials Ca and Fe were detected. Biodentine and MTA Plus contained Zr and its chemical relative Hf as an impurity. The materials containing Bi (MTA Plus, MTA Angelus, ProRoot MTA) also evidenced traces of Cr; both metals are trivalent, as may be Fe in these materials. In Biodentine, MTA Angelus, ProRoot MTA we detected traces of Sr, a chemical analogue of Ca. While not all nominal elements were found, non-specified minor and trace elements could be detected instead by XRF.

Conclusions XRF appears as a promising method for the analysis of endodontic cements, able to detect unexpected minor elements (Hf) and trace elements (Cr, Sr) and thus complement other

analysis methods. Further studies on these materials are in progress, also regarding their tissue tolerance.

GE91

A Comparative study of the solubility of three ProRoot MTA, Ortho MTA and Retro MTA (Invitro). *moshari AMIRABBAS1, akhavan HENGAMEH¹, Najafi AMMAR¹, sadighnia AZIN 2 ¹Department of Endodontics, Islamic Azad University, Dental Branch, ²shahid Beheshti University, Tehran, Islamic Republic of Iran

Aim the aim thisstudywas to compare the solubility of three ProRoot MTA, Ortho MTA and Retro MTA (Invitro).

Methodology ProRoot MTA, Ortho MTA and Retro MTA comprised each experimental group was consisted of the study group. 5 standardized stainless steel matrices (20±1 diameter, 1.5±0.1 height). Mixing protocol for each material was according to the manufacturer guidelines. All samples were immersed in double distilled water. Samples weight assessments were performed in 1h, 24h and 72h interval to determine the amont of weight loss due to the solubility. ANOVA test was used to analyze the resulting data. (P Value<0.005)

Results Ortho MTA was showed the best result after 24 hours, But the difference among ProRoot MTA, Ortho MTA and Retro MTA were not statically significant after 1 hour and 72 hours. ProRoot MTA had the most amont of solubility result after 24 hours. (P-value<0.05)

Conclusions Although Ortho MTA had the least of solubility, all of the studied materials showed acceptable results.

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Use of Mineral Trioxide Aggregate in the Treatment of Different Endodontic Problems : **Case Series**

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Aim:

To discuss the MTA use in treatment of teeth with internal root resorption and large periapical lesions with wide-open apices.

Introduction:

Case 3:

Filling the root canals of the cases with internal root resorption and wide-open apices using conventional techniques can be challenging. Using MTA can improve the treatment quality and prognosis.

Case 1:

-old male patient referred with spontaneous pain and intraoral elated to tooth #11. Radiographic exam showed resorptive areas a root, canal and periapical lesion. After chemomechanic A 32-yea and Ca(OH)₂ dressing for 10 days, root canal was obturated th MTA



Picture 1. Case 1, before treatment

Picture 2. Case 1, after treatment

A 45-year-old male patient came to our clinic with sensitivity to percussion and palpation on tooth #12. Radiographic exam showed internal resorption of the root canal and periapical lesion. Root canals were instrumented and then obturated using MTA.

Case 2:



Picture 3. Case 2, before treatment

Picture 4. Case 2, after treatment

A 17-year-old female patient referred to our clinic with intraoral swelling. Radiographic exam showed a large radiolucent area related to teeth #11 #12 and #13 which was later analyzed using CBCT. #12 was instrumented with hand-files and irrigated .Ca(OH)_2 was left in the root canal and changed every 7 days for 3 times. When the canal could be dried with paper points and the symptoms were vanished, root canal was filled using MTA to obturate the wide-open apex.





Picture 5. Case 3, before treatment

Picture 6. Case 3, after treatment

Case 4:

An 18-year-old female patient with a chief complaint of pain with pressure on the tooth #36 was admitted to our clinic. The OPTG showed a large radiolucent area in the periapical area of #36. After 4 Ca(OH)2 changes, the drainage from the distal root canal stopped and the symptoms were vanished. Mesial root canals were obturated with gutta-percha. The distal root canal had a wide-open apex which was obturated with MTA.





Picture 7. Case 4, before treatment Picture 7. Case 4, after treatment

Key Learning Points:

•MTA is a better choice than gutta-percha for filling the root canals with internal resorption and large lesions with wide-open apices in terms of sealing and obturation.



María Murillo Benitez, Carlos Vidal Tudela, Mª Carmen Jiménez Sánchez, Jenifer Martin-González, Juan José Segura Egea Master in Endodontics. School of Dentistry. University of Sevilla. Spain.

Aim: Different studies suggest that calcium silicate-based like materials, such as MTA, are biocompatible. These materials are also bioactive because calcium ions react with phosphate ions in the medium allowing the formation of hydroxyapatite and bone. The endodontic management of apex with large apical diameter using bioactive materials promoting periapical bone regeneration is reported.



Initial periapical radiograph showing radiolucent periapical lesions involving the root apices of 45 and 46. Diagnosis of persistent apical periodontitis was stablished.



During the non-surgical root-canal re-treatment a large apical diameter was detected. Apex measurements were larger than 0.050 mm. In the distal root-canal of 46 and in the root-canal of 45 an apical plug with MTA was placed. Mesials root-canals of 46 were filled only with guttapercha.



After one year follow-up, all radiolucent periapical lesions are decreasing, indicating periapical healing. The root-canals where the plug with MTA was placed showed faster periapical healing compared to those root-canals filled only with guttapercha. Periapical radiolucency is still evident in the mesial root of 46.

Summary: Several cases of molars and premolars with longstanding periapical lesions are evaluated. During the non-surgical root-canal treatment a large apical diameter was detected. Apex measurements were larger than 0.050 mm.





Apical stop with MTA



One year follow-up after

Key learning points:

· MTA, and others bioactive materials, can accelerate and improve periapical healing.

Apical plug with MTA is a predictable treatment option in cases of large apical foramen.

 MTA facilitates the correct sealing of apical third in molar with large apical diameter

GE93 Internal resorption in patient with type 1 glycogen storage disease Sepic Matanovic BM, Molnar M, Blazic Potocki Z. D Department of oral medicine, endodontology Dental Clinic Zagreb Aim: To present unusual internal root resorption in metabolically challenged patient. Introduction: Glycogen storage disease type I (GSD I) or von Gierke's disease, results from deficiency of the enzyme glucose-6-phosphatase, and has an incidence of 1 to 100,000 Incidence of 1 to 100,000. Deficiency impairs ability of liver to produce free glucose from glycogen and from gluconeogenesis. Since these are the two principal metabolic mechanisms by which the liver supplies glucose to the rest of the body during periods of fasting, it causes severe hypoglycemia and results in increased glycogen storage in liver and kidneys. Both organs function normally in childhood, but are susceptible to a variety of problems in adult years. Other metabolic derangements include lactic acidosis and hyperlipidemia. Frequent or continuous feedings of cornstarch or other carbohydrates are the principal treatment. Other therapeutic measures may be needed for associated problems. Case report: Patient, 28-year old female, came to our practice, complaining of severe pain and swelling in lower yaw. Upon oral examinations tooth 41 was found to be non-vital. Patient denied recent or past trauma, but on closer anamnestic dialogue, revealed unusual metabolic disease - type 1 glycogenstorage disease, which greatly impaired our time on the chair, since she was prone to frequent hypoglycemia. 41 were endodnticaly treated, using ProTaper Rotary System (Dentsply/Maillefer; Switzerland) and Thermafil (Dentsply Maillefer – Switzerland) obturation technique. A year after 42 became non-vital, so the same procedure was performed. On x-ray we saw distal bone resorption in first third of the root. Periodontal surgery was performed and the defect filed with Geistlich Bio-Oss bone substitute. Clinical Relevance References 1. Management of a Massive Resorptive Lesion with Multiple Perforations in a Molar: Case Report. Borkar S, de Noronha de Ataide I. J Endod. 2015 2. Treatment of internal resorption with mineral trioxide aggregates: a case report. Yadav P, Rao Y, Jain A, Relhan N, Gupta S. J Clin Diagn Res. 2013 Oct;7(10):2400-1 3. Glycogen storage disease type 1 and diabetes: learning by comparing and contrasting the two disorders. Rajas F, Labrune P, Mithieux G. Diabetes Metab. 2013 Oct;39(5):377-87.

GE94

Comparison of MTA ,CEM and Geristore on human gingival fibroblast attachment quantity *Esnaashari E

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Aim one of the concern following retrograde preparation and filling happens to to be bone and periodontium formation beside their neutral attachment to each other . paying attention to the type of retrofilling material can lead to lack of real regeneration . quality and quantity of cell attachment to retrograde filling material ,determines its biocompatibility, the purpose of this study was to evaluate the quantity of human gingival fibroblast attachment to three retrograde filling material Geristore , MTA and CEM using the the SEM quantitative measurement

Methodology 8 disks in each group was prepared and placed in fibroblast culture the specimen were fixed in osmium and different concentration and alcohol after 3 time periods being 24 and 72 hours and 1 week cellular counting was performed under scanning electronic microscope . **Results** The most amount of attachment was related to CEM after one week while Geristore showed

the least amount of attachment during 72 hours and 1 week

Conclusions the amount of attachment increased in CEM and MTA groups during different time period. On the contrary in Geristore group attachment which may be due to resin base and increasing toxicity.

GE95

Endodontic retreatment with Mineral Trioxide Aggregate for incomplete vertical root fracture *Nobuyuki TI, Noriko M

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Aim Vertical root fractures (VRFs) are a common cause of tooth loss. Early diagnosis of VRFs is imperative to avoid overtreatment and extensive bone loss. Little evidence exists though, relating the incidence of VRFs to the endodontic retreatment. Mineral trioxide aggregate (MTA) has been shown to be very effective in sealing the pathways of communication between the root canal system and periodontal tissue. MTA also showed the less cytotoxicity and antibacterial activity. The purpose of this study is to evaluate from a clinical point of view the MTA performance in VRFs cases. **Methodology** The new root-dentin adhesion method consists of the elimination of infected dentin

by ultrasonic device, followed by MTA obturation. Thirty-five teeth with incomplete VRFs were treated by this method under a dental operating microscope. Clinical symptom and radiographic appearance of bone loss lesions were followed up from 12 to 49 months.

Results Clinical and radiographic follow-up showed asymptomatic teeth after treatment, the success rate was 97%.

Conclusions The results showed that the new root-adhesion method using the ultrasonic device and MTA obturation is an effective therapy for incomplete VRFs. Endodontic retreatment with MTA is an alternative therapy that might improve the healing outcomes for patients presenting with complex and challenging endodontic condition.

Filling: Other

GE96

Assesment of effectiveness of different shaping and filling techniques in oval-shaped root canals Sezgin GP, *Gencoglu N

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Aim The aim of this study, was to compare the effectiveness of the different shaping and filling techniques in the oval shaped root canals.

Methodology 150 single-root extracted premolar teeth with oval shaped canal were used in this study. The roots were instrumented using the Reciproc system (n:75) or Step-Back technique (n:75) and then, subdivided into five groups according to the filling technique; lateral condensation, Microseal, Obtura, System B, Soft-Core. The specimens were scanned using cone-beam computed tomography. Percentage volume of gutta-percha & sealer and void in the coronal, middle, apical thirds of each canal were measured using OnDemad3D-App software program.

Results When the shaping techniques were compared, the teeth shaped with Step-Back technique showed statistically higher percentage of filling material than teeth shaped with Reciproc system (p<0.05). Regard to obutration techniques, lateral condensation showed statistically the higher percentage filling material than Soft-Core technique and no statistically significant difference was detected among the other groups (p<0.01).

Conclusions Althuogh all filling techniques were found to be effective in oburation of oval shaped canals, lateral condensation technique resulted more gutta-percha+sealer content than Soft core technique.

GE97

Comparative analysis of the antimicrobial action of endodontic sealer Acroseal, Sealapex and AH Plus setting against Enterococcus faecalis biofilm

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Aim Enterococcus faecalis is a gram positive bacteria that can resist to the endodontic therapy and maintain the infection present in the root canal system. Therefore, the use of endodontic sealers with antimicrobial activity could help to eliminate residual microorganism that have survived after

endodontic treatment. The present study aimed to compare the antimicrobial activity of the endodontic sealers Acroseal, Sealapex and AH Plus in vitro biofilm model.

Methodology It were prepared 144 bovine dentin specimens, twelve blocks for each cement in each experimental time that remained in plates containing culture medium inoculated with E. faecalis (ATCC 51299) for biofilm formation. After 14 days, the samples were transferred to another plate with test sealers and were kept at 37oC and 5% CO2 for 2, 7 and 14 days. Specimens without sealers were used as a control for each period. After each experimental, the samples were agitated in sonicator. The suspensions were agitated in vortex and serially diluted in saline and triple plaqued in m-Enterococcus agar. Colony forming unit were counted and the data were statistically analyzed using ANOVA, Shapiro-Wilk and Kruskal-Wallis one-way test (p<0.05) for the antimicrobial potential determination.

Results Results: Sealapex showed significant difference in all experimental times in comparison to all other groups. AH Plus and Acroseal showed antimicrobial activity just at 14th experimental day. **Conclusions** Conclusion: Neither of sealers setting tested was able to remove biofilm . The Sealapex showed higher antimicrobial activity in all experimental periods. All sealers examined the antimicrobial effectiveness was higher with over time.

GE98

Ability of different obturation techniques to fill canal irregularities using gutta-percha and RealSeal Alabsi S¹, *Alhadainy HA², Darrag AM², Mohammed AA³

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Aim To test the ability of gutta-percha and RealSeal to fill canal irregularities using different obturation techniques.

Methodology A split-tooth model with four artificially created defects on canal wall was used to compare three techniques, cold lateral (CLC), warm lateral (WLC), and warm vertical (WVC) used with gutta-percha and RealSeal obturating materials. The technique evaluation was based on defect replication quality as a function of defect location and size. Obturation mass was removed for visual evaluation on an ordinal scale, 0 to 4, based on how much each defect was replicated. Statistical analysis was performed using Kruskal-Wallis test and Mann Whitney test (p = 0.05).

Results Both warm techniques were significantly better than CLC. Based on defect sites, WVC was better than WLC in replicating the apical defect. There was no significant difference between replicating small and large middle defect for the two warm techniques. For filling materials, no significant difference was found between gutta-percha and RealSeal in all defect sites using WLC and WVC.

Conclusions Both gutta percha and RealSeal can similarly replicate canal irregularities with worm obturation technique. Worm condensation (either vertical or lateral) is proved to be better than the cold lateral condensation in replicating the apical defect.

GE99

Comparative evaluation of three different Monoblock obturation systems: an in vitro and clinical study

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Aim This study was designed to evaluate, clinically and radiographically, the effect of new three different monoblock obturation systems (RealSeal SE, ActiV GP, and EndoREZ) on the healing of perapical lesions. Also to evaluate the sealing ability and adaptation of these obturating systems

Methodology A total of forty healthy individuals with non-vital pulp and an apical radiolucency were selected for this study. They were randomly divided into four groups, (n=10) according to obturation system used; AH Plus, RealSeal SE, ActiV GP, and EndoREZ. A standardized crono-apical preparation technique instrumented all canals and obturation was performed according to manufacture recommendations. The patients were recalled for clinical and radiographic evaluation at 3,6,12, and 18 months intervals. Preoperative radiographs were compared to recall radiographs. For microleakage test, canals of sixty single rooted human teeth were prepared and obturated by the four tested materials and microleakage was determined using dye extraction method. Representive samples from each group were used to evaluate the adaptation of the obturation materials to canal walls using scanning electron microscope (SEM).

Results radiographic evaluation and clinical examination revealed 100% success rate for the EndoREZ and RealSeal SE groups, for AH Plus and ActiV GP groups, 90% success rate was obtained. There was no statistical significance in the healing outcomes between the four groups (Qui-square test). Microleakage evaluation using dye extraction test revealed significant difference between EndoREZ and both AH Plus and RealSeal SE, with no significant difference with ActiV GP (ANOVA test). SEM evaluation presented proper adaptation with no gap at the material dentine interface for EndoREZ and ActiV GP groups, while gap formation was observed with AH Plus and RealSeal SE groups. **Conclusions** Although the proper sealing ability and better adaptation of EndoREZ and ActiV GP, monoblock obtutration systems had a comparable healing potential between them and to that of conventional obturation system (GP/AH Plus).

GE100

Effect of Post Space Preparation on Apical Obturation Quality in Teeth Obturated with Different Obturation Techniques

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Aim To evaluate the effect of post space preparation on apical obturation quality in regards of different obturation techniques.

Methodology Sixty-four single-canal teeth divided two experimental group (n=30), positive (n=2) and negative control groups (n=2). In group 1; teeth were prepared with TF Adaptive Small; (35/0.04), group 2; prepared by TF Adaptive Medium; (35/0.06). The experimental groups were divided three subgroups (n=10) according to obturation technique.

Group 1A; were obturated with #35 gutta-percha master cone/AH plus/lateral compaction technique, Group1B; TF gutta-percha (35/0.04) single cone technique/AH plus, Group1C; continuous wave of condensation technique (Elements Obturation Unit)/AH plus.

Group 2A; were obturated with #35 gutta-percha master cone/AH plus/lateral compaction technique, Group2B; TF gutta-percha (35/0.06) single cone technique/AH plus, Group2C; continuous wave of condensation technique (Elements Obturation Unit)/AH plus

Negative control; prepared/obturated/fillings were not removed. Positive control; prepared/unobturated.

3 days after obturation post space preparation were prepared and the fiber-post (Snowpost) was cemented in all samples preserving apical 5 mm of the fillings. 24 hours later, apical microleakage values of each group were measured using a fluid transport device. The results were recorded and statistically analysed with Two-way ANOVA.

Results The results demonstrated that between obturation and preparation technique interaction were not statistically significant (p>0.05). Comparing obturation techniques, there was a significant difference among the groups (p < .05). Differences in obturation technique were observed at group 1A. This group showed the lowest amount of leakage values. The mean values were greater in group

1B; however, statistical analysis revealed no significant differences among the preparation techniques (P>0.05).

Conclusions After the post space preparation, preparation techniques did not affect the apical leakage but obturation techniques influenced apical leakage significantly. While lateral compaction and continuous wave of condensation technique showed similar leakage value, the single cone technique showed the worst results.

Repair of root perforation using Mineral Trioxide Agregate(MTA) barcelona



M. Espinoza, J.A. González, F. Durán-Sindreu.

Aim: Asses the outcome for teeth with root perforations managed by the placement of mineral trioxide aggregate (MTA).

Introduction:

Perforations lead to inflammation and the destruction of periodontal fibers, alveolar bone causing cause a periodontal defect. It is important to diagnose and repair perforations immediately if possible. MTA is reported to have good long-term sealing ability for root perforations regardless of the location.

Clinical Case:

Female patient referred from a particular clinic, that arrive to Clínica Universitaria de Odontología (CUO), because during the cavity procces, failed to find the root canals, during that process the furcal perforation was created. In a clinical view we can identified the furcal perforation. The treatment , performed was to seal the

Agregate(MTA), and subsequently the root canal treatment was performed.

Sealing of the perforation



Mente J, Leo M, Panagidis D, Saure D, Pfefferle T. Treatment outcome of mineral trioxide aggregate: repair of root perforations-long-term results. Journal Endodontic. 2014; 40(6):790-6

Restoration

GE102

Conservative restoration after root canal treatment and excessive loss of tooth structure Vukoje K¹, Brkanić T², *Stojšin I², Panić Z¹

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Aim: The aim of this case is to show a reconstruction of an endodontically treated teeth, with great loss of tooth structure, using direct fiber-reinforced post system and direct composite restoration. Summary

Reconstruction of the coronal part of the tooth is an important and integral part of every endodontic treatment. The use of fiber-reinforced composite (FRC) posts to restore endodontically treated teeth has gained popularity due to its mechanical and esthetic characteristics and good properties of the adhesive systems.

Case presentation

two years.

A young female patient, 21 years of age, was addressed to the Dental Clinic for endodontic treatment of a complicated root canal system on the lower left molar. The patient also had a deep subgingival fracture of the buccal wall, and mesial wall of the tooth was also missing. After canal preparation and obturation, the patient was scheduled for direct composite reconstruction due to lack of financial resources for ceramic crown placement. After the preparation of the canal and cementation of a FRC post (Core & Post System, Dentsply), particular attention was paid to the incremental and curing techniques adopted to reconstruct the coronal part of the tooth (SDR and Ceram X Mono, Dentsply). In the subgingival area a light-cured glass ionomer was placed. **Discussion:** The prognosis of endodontically treated teeth depends not only on the success of the endodontic treatment, but also on the type of reconstruction. In this case direct composite reconstruction was made shortly after root canal therapy and it provided good coronal seal and occlusal function on control examinations after

Conclusions and Clinical Relevance

Direct composite reconstruction of endodontically treated teeth is a good alternative to prosthodontic therapy that can offer a timely solution and postpone prosthodontic reconstruction until it becomes convenient.



Micro-CT Analysis of Cement and Void Volume in Oval Shaped Canals Restored with Oval Fiber Posts and Their Effect on Push-Out Bond Strength *Uzun I, Güler B, Keskin C, Keleş A Department of endodontics, ondokuz mayis university, SAMSUN, Turkey

Aim To evaluate volume of the cement and voids in oval shaped canals restored with either oval or circular-shaped posts by microCT analysis and investigate the effect of cement and void volumes on bond strength.

Methodology 24 extracted mandibular prernolars with oval root canals were root canal treated and then divided into 2 groups randomly. Group I was restored with Ellipson oval fiber post system whereas Group 2 was restored with conventional circular fiber posts.Each specimen was mounted on a custom attachment, and scanned using a high-resolution micro CT system. The volumes of interest for the coronal and apical sections of the post were selected from the middle of the post in the root canal. The volume of cement and any voids inside the region of interest were analyzed. All areas without post and cement material within the root canal space were considered as voids. Lateral or accessory canals were not considered in the analysis. Then each specimen was sectioned perpendicular to its long axis using a precision saw at a slow speed under water cooling and thin slice push-out test was applied.

Results The push-out bond strength of the oval posts (apical: $11,781 \pm 2,512$ and coronal: $16,865 \pm 1,812$) were significantly higher than those of the round posts (apical: $8.124 \pm 2,055$ and coronal: $12,046 \pm 2,552$). In coronal and apical thirds, the volume of void and cement values of the oval posts were higher than those of the round posts.

Conclusion In the light of higher bond strength of oval fiber posts it can be suggested that voids trapped within post space might act as a stress absorber and increase bond strength of posts and push-out bond strength could not be affected by resin cement thickness around the post.

GE104

Structural changes in enamel and dentin after the application of hydrogen peroxide 37.5% and carbamide peroxide 35%

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Aim Aim: to describe morphological and mineral changes in enamel and dentin after internal bleaching with hydrogen peroxide 37,5%(HP) and carbamide peroxide 35% (CP). Using confocal laser microscopy (CLSC) and energy-dispersed x-ray (EDX) spectroscopy .

Methodology Methodology: Twenty endodontically treated human teeth were divided into four groups. Each tooth was longitudinally sectioned to get an experimental and control sample. Control samples of all groups were conserved in artificial saliva during all the procedure. Experimental samples of groups 1 and 2 were treated with HP (Pola Office +-SDI-) making three aplications of ten minutes each one (30 minutes), and groups 3 and 4 with CP (Pola Day CP –SDI-) making three applications of 30 minutes each one (90 minutes), simulating clinical conditions. In both cases, the bleaching agent was applied in enamel and dentin. Changes in enamel were evaluated for groups 1 and 3 and dentin changes for groups 2 and 4. Morphological changes were evaluated with CLSC. Mineral changes (proportion of calcium- Ca- and phosphate-P- existing in each experimental sample and its control) were evaluated with environmental scanning electron microscopy in association with and EDX system. Mineral changes among experimental group and its control were analyzed with Wilcoxon test with a considering signification when p<0,05.

Results Results: Morphological study showed similar changes in the morphology of the prisms of the bleached enamel with both bleaching agents. However, there were not changes in the morphology of the dentin The proportion of Ca and P was lower as much in enamel as dentin of the treated teeth

in comparison with their controls, although the differences were significant only for the Ca proportion(p<0,05). c

Conclusions Conclusion: Bleaching with high concentration peroxides produced morphological changes in enamel. The ratio of CA y P decreased in both enamel and dentin after treatment.

GE105

Effect of two different sizes of post drills on surface temperature rise of two different tooth types: An ex-vivo infrared thermographic analysis study

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Aim Rotary motion of the post drills may lead to dangerously high temperature rise on root surface. Temperature increase 10°C higher than regular body temperature has harmful effects on surrounding tissues. The aim of this study was to evaluate temperature rise on root surfaces of two different tooth types during dowel preparation by using two different sizes of post drills. Summary This study included 42 human incisor teeth (14 lower incisors, 28 upper incisors). Root canals were instrumented with ProTaper instruments and filled with gutta-percha and sealer. A CBCT scan was taken to detect the thinnest part of the dentinal wall of each root. The roots were embedded in acrylic resin 1 mm from coronal parts that provided the match of teeth to the special holder. Teeth were divided into three groups according to the size of post drill and tooth type as follows: group 1, size 1 GF post precision drill (1,1 mm, Polydentia, Mezzovico-Vira, Switzerland) used in upper central incisor; group 2, size 3 GF post precision drill (1,5 mm) used in upper central incisor; group 3, size 1 GF post precision drill used in lower central incisor. Temperature changes were measured from the thinnest root surfaces by using a FLIR SC6000 thermal camera and recorded. The data were statistically analysed by using one-way ANOVA and post-hoc Tukey tests (p<.05). There were significant differences between groups. Group 3 (mean temperature rise: 14,95°C) demonstrated higher temperature rise than group 1 (mean temperature rise: 8,47°C and P<.001) and group 2 (mean temperature rise: 9,75°C and P<.001). There wasn't a significant difference between group 1 and 2 (p>.05).

Key Learning Points

• Within the limitations of this ex-vivo study, dowel preparation in lower incisors dangerously increased the temperature over the critical threshold even with the use of smallest drill. Determining the optimal post drill size for post space preparation i

Retreatment

GE106

PASSIVE ULTRASONIC IRRIGATION OF THE ORANGE OIL IMPROVES THE REMOVAL OF RESIDUAL ROOT FILLING MATERIAL - A MICRO-COMPUTED TOMOGRAPHY STUDY Michelon C¹, *Pillar R¹, Bello MDC¹, Lang PM², Bier CAS¹

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Aim The aim of this study was to evaluate the efficacy of passive ultrasonic irrigation (PUI) with an organic solvent in the removal of residual root canal filling material during endodontic retreatment using high-resolution micro-computed tomography (micro-CT).

Methodology Thirty curved mesial roots from mandibular molars presenting isthmus area were selected through high-resolution micro-CT scans. The specimens were instrumented and filled with gutta-percha and Endofill by Tagger's hybrid technique. The residual root canal filling material was removed with ProTaper retreatment instruments followed by F1-F4 ProTaper Universal instruments. In the Manual group, the specimens were irrigated and handly agitated with Orange Oil solvent,

2.5% NaOCl and 17% EDTA. In the PUI group, the specimens were submitted to PUI with Orange Oil solvent, 2.5% NaOCl and 17% EDTA. Thereafter, the micro-CT was used to measure the volume of the residual root canal filling material after each stage of the retreatment procedure. Statistical analysis was performed using the Friedman and Mann Whitney tests.

Results The protocols of irrigation of the Manual and PUI group decreased the amount of residual root canal filling material comparing only with the removal through rotary instruments (P < 0.05). The PUI Group showed a significant percentage reduction of the residual root canal filling material than the Manual Group, for all the thirds (P < 0.05).

Conclusions None of the irrigation protocols were able to completely remove the residual root canal filling material from curved canals with an isthmus area. However, the PUI protocol showed to be more efective than the Manual regarding the removal the root canal filling.

GE107

Efficiency of Three Essential Oils Extracted From Medicinal Plants in the Retreatment of Teeth Obturated With Three Gutta-Percha Brands

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Aim The study evaluated the efficiency of essential oils extracted from medicinal plants in dissolving three gutta-percha brands and compared the efficiency of Navel orange (room temperature), Common mandarin (40 °C) and Cardamom (40 °C) in re-treatment.

Methodology Essential oils from thirty five medicinal plants, representing six families of aromatic plants growing in Egypt, were extracted by steam distillation and tested for dissolving three gutta-percha brands (Hygenic[®], Maillefer[®] and Meta[®]) at room temperature r.t. and at 40 °C. Based on the dissolution efficiency three oils having the highest dissolution rates were chosen in re-treatment; two essential oils from Family Rutaceae; Navel orange (r.t.), Common mandarin (40 °C) and one from Family Zingibraceae; Cardamom 40 °C. Sixty single rooted teeth were prepared and equally divided into three groups for obturation by the three gutta-percha brands and Zinc oxide eugenol sealer. Re-treatment was done by the three oils and chloroform using H- files in crown-down manner. Re-treatment time was recorded. Roots were split longitudinally. Stereomicrographs were evaluated by image analysis software for determining the remaining debris. Data were subjected to analysis of variance; significance was set at P< 0.05.

Results Re-treatment time generally ranged between 2.3-4.5 min, where Navel orange recorded the statistically highest on Maillefer[®] (p=0.001), and Common mandarin recorded the lowest on Meta[®](p=0.001). The remaining debris was not statistically significantly different for each of the three oils on the three brands, Common mandarin yielded the highest range (42.2%-45.5%), followed by Navel orange (22.2%-30%), the least was Cardamom (17.1%-28%). Chloroform showed the highest statistically significant debris % with Meta (55.9%), p=0.02.

Conclusions This work emphasized the ease of preparation and use of a natural essential oil as a safe solvent in endodontics instead of using toxic solvents. Navel orange (r.t) and Cardamom (40 °C) can be considered as practical gutta-percha solvents.

Retreatment procedures performed by dental students-clinical cases *Brkanić T¹, Stojšin I¹, Vukoje K² ¹Dental Department, Endodontics, Dental Clinics of Vojvodina, Medical Faculty, ²Dental Department, Endodontics, Medical Faculty, University of Novi Sad, Novi Sad, Serbia

Aim: The aim of this report is to show the clinical skills of final year dental students in successful retreatment of previously treated root canals.

Summary: Endodontic nonsurgical retreatment is most often the first choice to overcome a failed endodontic therapy. Removal of root canal filling material is a prerequisite for canal repreparation and it can be done with thermal, mechanical and chemical methods, but usually a combination of these methods is used. Retreatment procedures can be very complex and time consuming, even for an experienced endodontist.

Case presentations:

The first patient is a 24 year old female patient, requiring retreatment for further prosthodontic reconstruction, on the upper left first premolar, with a chronic periapical lesion. The removal of old filling material was done with Hedstrom files and eucalyptus oil and repreparation continued with K-files in a step-back manner.

Another female patient, 22 years of age, addressed the Dental Clinic during endodontic practice for dental students. A complicated canal system of an upper left first molar was desopturated with the aid of ProTaper Retreatment files and eucalyptol. Also, a previously non-prepared MB canal was shaped for further obturation with gutta-percha cones and Apexit sealer.

Patient B.E. (40 years), with a technically poor obturation and transportation in the mesial canals of a lower left first molar, needed retreatment. The obturation from the root canals was removed with a combination of hand and rotary instruments. After establishing the right canal path, further instrumentation was done with ProTaper System followed by appropriate obturation.

Key Learning Points: In many cases, failed endodontic therapy can be corrected with nonsurgical retreatment procedures through better canal debridement, disinfection and obturation. Despite the fact that these procedures require great skill and experience, dental students, with good guidance, can also be successful in achieving these goals.







RETREATMENT OR WA

Rodríguez, A., Aguilar, G., Andrés, C., Juárez, I., Rodríguez, N., Garrido, P.

CASE PRESENTATION: A 24 years old female with no remarcable medical condition is sent to our department from the orthodontics department to evaluate a periapical lesion in tooth #12, asyntomatic and with a composite build-up in good condition.

APRIL 2012



SEPTEMBER 2014



After checking the clinical records, it comes out that the previous root canal treatment was made by our department in April 2012.

Evaluating the diagnostic periapical Rx before treating the tooth for the first time and comparing it with the Rx of September 2014 and the actual lesion (February 2015) we appreciate a considerable reduction of the lesion.

FEBRUARY 2015



Doing a review in similar cases it shows that in time the periapical lesions progress positively.

Molven et al. observed late periapical changes in roots treated endodontically, with more successes tan failures more than 10 years after treatment.

M.B.M. Thomas et al. in their study demonstrate delayed healing, compared to accepted healing timescale. A case with evidence of radiographic healing of a periapical lesion 12 years after root canal treatment.

CONCLUSION

When previous radiographs are not available, the risk of doing an innecesary treatment is high. The clinician should be aware of the possibility of a delayed healing and use serial radiographs.

Radiographic evidence of postoperative healing 12 years following root canal treatment- a case report. M. B. M. Thomas, S. J. Hayes and S. M. Gilmour.

Periapical changes following root-canal treatment observed 20-27 years postoperatively. O. Molven, A. Halse, I. Fristad and D. MacDnald-Jankowski.

Fracture resistance of roots after additional retreatment procedures *Keleş A¹, Uzun İ¹, Arslan H², Kamalak A³, Doğanay E², Cangül K¹, Akçay M⁴ ¹Department of Endodontics, Ondokuz Mayıs University, Faculty of Dentistry, Samsun, ²Department of Endodontics, Atatürk University, Faculty of Dentistry, Erzurum, ³Department of Endodontics, İnönü University, Faculty of Dentistry, Malatya, ⁴Department of Pediatric Dentistry, Katip Çelebi University, Faculty of Dentistry, İzmir, Turkey

Aim Additional retreatment procedures improve the removal of filling materials from root canals after retreatment. The aim of this study was to compare the fracture resistance of roots when additional retreatment procedures applied after retreatment files.

Methodology One-hundred seventeen human mandibular canine teeth with similar dimensions were selected. Teeth were then randomly divided into nine groups (11=1³)). Thirteen teeth were left nonprepared and served as a control (Group 1), and the remaining 104 teeth were instrumented. Thirteen teeth were assigned to an only prepared group (Group 2). With the exception of these groups, root canal filling was done all of the groups. Thirteen teeth were assigned to an only filling group (Group 3), and the remaining 78 teeth were assigned to retreatment groups as follows: R-Endo group (Group 4), R-Endo + SAF (Group 5), R-Endo + Passive ultrasonic irrigation (PUI) (Group 6), R-Endo + Er YAG (Group 7), R-Endo + Nd YAG (Group 8) and R-Endo + PIPS (Group 9). All of the roots were mounted vertically in copper rings and the rings were filled with acrylic resin, exposing 8 mm of the coronal part. A universal testing machine was used for the strength test. The results were analyzed using the oneway ANOVA test. The significance between the groups was then tested with the Duncan test (P = 0.05). **Results** The fracture strengths of the retreatment groups were lower than groups 1(0.465±0.108). 2 (0.380±0.152) and 3 (0.419±0.114) (P < 0.05). There were no significant difference between R-Endo group (0.290±0.097) and additional retreatment procedure groups; R-Endo+SAF group (0.274±0.105), R-Endo + PU! group (0.243±0.096), R-Endo + Er:YAG group (0.295±0.133), R-Endo + Nd:YAG group (0.242±0.074) and R-Endo + PIPS group (0.237±0.087) (P> 0.05).

Conclusions The results indicate that the retreatment of root canal filling had a significant effect on fracture resistance. Additional retreatment procedures had no significant effect on fracture resistance after retreatment, regardless of the type of procedures.

GE111

Effect of three different solvents used in endodontics on Thermafil carriers *Vera Lopez A Master endodoncia, Universidad Complutense de Madrid, Madrid, Spain

Aim aim of this study is to analyze the effect of three different solvents used in endodontics, on Thermafil 25/04 carriers

Methodology Forty five Thermafil 25/04 carriers were used. After removing the gutapercha cover from the carriers, their weights were measured on a micro-bascule.

We divided the carriers into 3 groups. The carriers in Group #1 were immersed in Chloroform; the carriers in Group #2 in Endosolv-E, and the carriers in Group #3 were immersed in Endosolv-R.

The times for the immersions for each group were one minute, five minutes, and one minute with Sonic activation; and after each immersion the carriers weights were measured.

The pre- and post immersion values in each group and each time were compared with the Student's t test for paired samples.

Results Results: The carriers suffered weight increase statistically significant with all solvents. It suggests that they absorbs the solvents.

Conclusions Conclusions: Chloroform, Endosolv-E and Endosolv-R increases the weight of Thermafil 25/04 carriers.

Surgery GE112 WITHDRAWN

GE113

Review of apical surgery service provision within a multidisciplinary unit *Chesterman JA1, Greenhalgh R², Carter L², Bhakta S² Departments of ¹Restorative, ²Oral and Maxillofacial Surgery, Leeds Dental Institute, Leeds, United Kingdom

Aim Aim: To assess the provision of apical surgery within the Leeds Teaching Hospitals compared to the Royal College of Surgeons (RCS England) Guidelines for Surgical Endodontics.

Methodology Methodology: Records of fifty-eight patients who underwent apical surgery over a two year period were reviewed retrospectively. Referral patterns, indications, techniques,

complications and outcomes of apical surgery were compared between the departments and to the recognised guidelines.

Results Results: Signs and/or symptoms of persistent infection following primary root canal therapy were present in all cases, however, justification for lack of secondary root canal treatment was not always evident (n=12). Flap design varied between the departments but almost all (n=57) were compatible with the guidelines. Ultrasonic root-end preparation is advised in the RCS guidelines, but this was only done in the restorative department due to availability of equipment. A variety of retrograde root filling materials were placed, again compatible to the guidelines. Complications and follow up were not completed for all patients, as many returned to their referring dentist following surgery.

Conclusions Conclusions: This review has prompted the creation of local acceptance guidelines and a procedure protocol to standardise practice across the Leeds Teaching Hospitals in accordance with the RCS guidelines. Further data and dedicated follow up is needed to validate outcomes and survival rates. As ever, good quality record keeping is essential to retrospectively justify treatment modalities.

GE114

Periapical healing after tissue/bone regeneration in apical microsurgery: Results after 12 months using periapical radiography and cone-beam computed tomography

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Aim To compare periapical healing (after 1 year) in teeth that undergone periapical microsurgery with and without tissue/bone regeneration with the use of periapical radiographs (PR) and conebeam computed tomography (CBCT).

Methodology There were 18 patients undergoing periapical microsurgery with a total of 21 teeth consecutively enrolled in this study from 2011 to 2013. Patients were fully instructed about the surgical procedure, postoperative care, follow-up examinations, and alternative treatment options. Each patient signed a consent form according to the declaration of Helsinki.

Clinical, radiographic and tomographic data corresponding to each tooth were recorded. Each treated tooth were assigned to one of two groups; Group 1 with guided tissue/bone regeneration; Group 2: without guided tissue/bone regeneration.

Healing at the first year follow-up was judged clinically and using PR and CBCT. The images were independently evaluated by the three independent calibrated examiners. Radiographic periapical healing was determined as complete, incomplete (scar tissue formation), uncertain, or unsatisfactory, according to the criteria established by Rud and Molven. Teeth were classified as "healed" when presenting with complete or incomplete healing without clinical signs and

symptoms. Teeth were classified as "not healed" when presenting with uncertain or unsatisfactory healing or with clinical signs or symptoms regardless of the radiographic appearance (strict criteria) and according the increase or decrease of the periapical lesion (no strict criteria).

All data were first analysed descriptively and were classified with a qualitative dichotomous variable. A comparison of PA and CBCT images for the identification of the presence or absence of AP

radiolucencies was made using McNemar's test on paired single roots. The level of significance was set at $P \le 0.05$. The Kappa value was used to assess examiner variability.

Results Of total examined (21 teeth), 6 teeth (29 %) were classifieds as "healed" and 19 teeth (90 %) "healing" while 1 (4.7 %) were considered "not healed".

The results did not show significant differences in the assessment of periapical lesions among the RP and CBCT.

Conclusions Prospective, randomized clinical studies using CBCT as a tool to define the outcome of apical microsurgery are required.

GE115

An audit to assess the referral criteria and clinical techniques employed by an Oral and Maxillofacial Surgery Department and Restorative Dentistry Department when completing Surgical Endodontics *Patel R^{1,2}, Porter R¹, Creedon A²

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Aim To assess if there are any differences in referral criteria and acceptance and clinical techniques employed by an Oral Surgery Department (Ashford and St Peter's) and a Restorative Dentistry Department (St George's Hospital) in the United Kingdom

Objectives Are both department standards for treatment indication and acceptance and clinical techniques in keeping with the national guidelines for surgical endodontics as set out by the Royal College of Surgeons of England (1)

Method A retrospective audit of the last twenty apicectomies completed on an Oral Surgery Department and on a Restorative Dentistry Department. The areas noted were:

Treatment indication noted by referrer, Treatment indication noted by clinician in secondary care when referral accepted, Radiographic assessment, Magnification, Soft tissue management (flap design), Root end resection, Root-end preparation, Root-end filling, Closure of the surgical site, Outcome at one year

Discussion: Which Department performed in line with the National guidelines and in what areas. When guidelines were not being followed, was there an acceptable reason.

Conclusions: The results showed the Restorative Department to select and complete cases in line with the national guidelines more so than the Oral and Maxillofacial Surgery Department. Neither Department had adequate data to assess outcome. Results showed primary care practitioners also required further training on referral indication.

Recommendations:

Training of staff on the Oral and Maxillofacial Department regarding surgical endodontics indications and contraindications

Training of local primary care practitioners regarding surgical endodontics indications and contraindications

Consideration of use of magnification (loupes or microscope) and how to facilitate this on each Department

Review of ease of facilitation of clinical techniques to aid treatment on the Oral and Maxillofacial Surgery Department: root-end filling materials, equipment and skill-set Patient information leaflet

Basic science pulp

GE116

Differential expressions of matrix metalloproteinase-13 in sound and carious dentin -A pilot study *Lee L

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Aim The purpose of this study is to examine the expression of MMP-13, using immunofluorescent staining by dividing the dentin of sound and carious teeth into the crown and root. The null hypothesis is intense expression of MMP-13 is observed in carious dentin. Clarification of MMP-13 expression in the dentin of carious teeth is significant in understanding the role of intrinsic collagenase in the progression of caries.

Methodology Two extracted teeth were used. A sound tooth without caries and a tooth with wide range of dental caries invaded dentin were used. Teeth were divided into crown and root. Two sections were obtained each from isolated crown and root. Each section was cut parallel to the major axis of the tooth. Five micrometer-thick sections were obtained using a microtome Prepared sections were hybridized with anti-mouse MMP-13 primary antibody and FITC-conjugated secondary antibody. Immunofluorescence of the FITC of the MMP-13 in coronal and radicular dentin was analyzed by confocal microscopy.

Results Immunofluorescence signals that were indicative of MMP-13 were observed in coronal dentin of sound teeth and in carious teeth with a wide range of caries that invaded dentin. The expression of MMP-13 in carious coronal dentin was differently distributed depending on caries involved areas. Immunofluorescence signal intensity was lowest in the sound dentin, and strong immunofluroescent reaction was detected in caries-affected dentin. Intense immunofluroscent reaction was observed around the dentinal tubule, and distinctive expression was seen in the border of infected and affected dentins. Distinctive expression was also observed in pulp of carious tooth. MMP-13 expression was not detected in the root dentin of both sound and carious teeth. **Conclusions** The expressions of MMP-13 in carious dentin imply the roles of MMP-13 in caries progression. This is the first study to determine the presence of MMP-13 in the dentin using immunofluorescence analysis. Future studies with larger sample sizes may be needed to clearly elucidate roles of MMP-13 in progression of caries.

GE117

Chlormadinone acetate induces odontoblastic differentiation of human dental pulp stem cells *Kim SM, Lee HI, Kim DH, Kim HJ, Lee BN, Hwang YC

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Aim Chlormadinone acetate (CMA) has antiandrogenic activity and suppresses gonadotropin secretion, thereby reducing ovarian and adrenal androgen production. However, the effect of CMA on human dental pulp stem cells (DPSC) differentiation and mineralization has not been studied. The aim of this study was to investigate the effect of CMA on differentiation and mineralization of human DPSC.

Methodology This study was carried out using the primary human DPSC from the third molar. The cytotoxicity of the CMA was evaluated by XTT assay. The expression of alkaline phosphatase (ALP), osteocalcin (OCN), dentin silophosphoprotein (DSPP) and dentin matrix protein-1 (DMP-1) at gene level were detected by reverse transcriptase polymerase chain reaction (RT-PCR). The expression of ALP phenotype and calcium nodule deposition were evaluated by ALP staining and alizarin red staining.

Results There was no statistically significant difference in cytotoxicity. The messenger RNA level of odontoblastic genes increased in 1uM CMA at 5 days. Treatment with CMA increased the expression of ALP phenotype, mineralization nodule formation and calcium deposit in human DPSC. **Conclusions** CMA has no cytotoxicity and increases the odontogenic differentiation of human DPSC.

GE118

Down-regulation of Inflammatory Mediator Synthesis and Infiltration of Inflammatory Cells by Benfotiamine in LPS Induced Rat Pulpitis

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Aim The aim of this study was to evaluate the possible response of benfotiamine to inflammation and oxidative stress parameters in LPS induced rat pulpitis model.

Methodology Pulpitis was induced in the upper and lower incisors of Wistar rats (N=54) by treating them with LPS for 6, 12 and 24 hours in the presence or absence of benfotiamine. Pulpal inflammation was histologically evaluated and immunohistochemical localization of IL-6, PGE2, CGRP, MDA and SOD was examined. Data were analyzed by using ANOVA followed by Bonferroni–Dunn test (P < .05)

Results Administration of LPS to pulp induced inflammatory reactions at 6 hours in groups 2 and 3. IL-6 synthesis was up-regulated in LPS stimulated rats in group 2 in comparison to negative control group in all time periods (p<0.01). Increase of IL-6, PGE2 and CGRP levels in group 2 at 12 and 24 hours (p<0.001) was down-regulated by benfotiamine in group 3 (p<0.001). It was observed that benfotiamine (Gr. 3) decreased the histopathological scores compared to the group 2 in all time periods (p<0.001). Synthesis of PGE2 and CGRP did not show any difference between the groups at 6 hours (p>0.05). There were no significant differences between the groups in terms of MDA and SOD expressions at all time periods (p>0.05).

Conclusions Our findings support the antiinflammatory functions of benfotiamine in rat pulps, suggesting its potential usefulness as a novel antiinflammatory agent for pulpal inflammation.

GE119

Stimulatory effect of leptin in the dentin matrix acidic phosphoprotein (DMP1) production in human dental pulp.

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Aim Leptin , a mediator of the inflammatory response , and its receptor (LEPR) are expressed in the human dental pulp. Dentin matrix acidic phosphoprotein (DMP1) is a protein involved in odontogenesis and the dentin-pulp reparative response. This research aims to study the effect of leptin on the expression of DMP1 by human pulp cells

Methodology Twenty-five dental pulp samples were obtained from freshly caries- and restorationfree extracted human third molars. The pulp samples were processed and mineralization produced by odontoblasts in response to leptin was determined analyzing the expression of DMP1 by immunoblot and by real time PCR (qRT- PCR). Statistical analysis was performed using the GraphPad Prism computer program (GraphPad Software, San Diego, CA. USA). Statistically significant differences between stimulated or not dental pulp samples were tested using the Mann–Whitney rank sum test and multivariate ANOVA. Significance levels were set at p < 0.05.

Results Leptin dose-dependently stimulated dentin matrix acidic phosphoprotein expression in human dental pulp. Western blot analysis of leptin-stimulated human dental pulp samples revealed

the presence of a protein with an apparent molecular weight of approximately 42 kDa, which corresponds, to the estimated molecular weight of DSPP. The expression of DSPP mRNA was confirmed by qRT-PCR analysis

Conclusions For the first time it has been demonstrated that the binding of leptin to LEPR results by DMP1 production by odontoblasts. These findings suggest that leptin plays a role in the defensive response pulp and dentinogenesis

Acknowledgements University of Seville

GE120

Effects of S-PRG filler-containing coating resin to prevent demineralization and healing pulp tissue after cavity preparation.

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Aim The purpose of this study was to evaluate the ability of a coating material containing the surface pre-reacted glass-ionomer (S-PRG) filler to protect the surface of exposed dentin after cavity preparation from demineralization and healing pulp tissue in vivo.

Methodology A groove-shaped cavity preparation on the mesial cervical surface of the upper first molars and capping with PRG barrier coat, and samples were collected at intervals of 1, 3, 5 and 7 days. The demineralized paraffin sections were processed for immunohistochemistry for Nestin and Hematoxylin Eosin.

Results Bacteria infection reached the pulp of tooth and abscess formation was observed in pulp after 3 days an operation, although Nestin positive cells was observed in abscess after 7 days in non-treated control group. A smear layer covered on surface of exposed dentin in control group after 3 days. The pulp infection was also observed, and arrangement of Nestin positive cells was observed after 3 days in non-treated control group. On the other hand, the infection pulp tissue was not observed by experimental coat group, and arrangement of Nestin positive cells were completed after 3 days, and the pulp tissue healing is better than non-treated control group.

Conclusions The results showed that S-PRG filler containing coating resin may be an effective material for protecting the pulp infection and promoting the tooth healing.

Histopathology periapical lesions

GE121

In vivo comparison of MTA and Endosequence, which are used in endodontic root repair materials in terms of biocompatibility.

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Aim The aim of this study is to investigate the comparison of MTA is considered activity and ERRM is a newly developed bioceramic material in terms of biocompatibility and contribution to the formation of new bone tissue.

Methodology In this study, 42 male 10-12 weeks old Wistar-albino rats were used. 6 research groups were created. Group 1 (MTA) was controlled in 14 days. Group 2 (MTA) was controlled in 60 days. Group 3 (ERRM) was controlled in 14 days. Group (ERRM) was controlled in 60 days . Groups 5-6 were controlled groups (14 days and 60 days periods respectively). In the each MTA groups MTA-paste was prepared with distilled water and MTA-powder in 1:3 ratio according to manufacturers guide, in the each ERRM groups offered by the manufacturer as ready. The materials were mixed freshly before the experiment took place and implanted intraosseusly in one tibia of each rat. In
control groups emty polethylene tubes were implanted instead. The subjects were controlled in 14 days and 60 days periods. 6 groups, including two subgroups were created for each group. **Results** In 14 days and 60 days periods, both material were better formation of new bone tissue compared to control groups. In 14 days, ERRM showed better formation of new bone tissue from MTA,In 60 days they showed same values. About formation of new bone tissue, there was no statistically difference between MTA and ERRM (p=0.039), but there was a statistically different significant between 14 days and 60 days. Inflammatory reaction, fibrosis, necrosis, foreign body reaction were no statistically significant difference was observed in all groups.

Conclusions This results suggest that ERRM is biocompatible and contributing to the formation of new bone tissue like MTA. ERRM can be said to be used an alternatif material to MTA for ease of handling and administration.

GE122

INTERLEUKIN-33/ST2 AXIS IN HUMAN PERIAPICAL LESIONS

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Aim Interleukin-33 (IL-33) is a recently identified cytokine belonging to the IL-1 family and ligand for the IL-1 receptor-related protein ST2. IL-33/ST2 signaling plays a critical role in allergy, autoimmunity, and chronic inflammatory disorders, but its role in the pathogenesis of periapical lesions is unknown. We aimed to investigate the expression patterns of IL-33 and ST2 in human periapical lesions.

Methodology Periapical lesions (n = 36) and healthy periapical tissues (n = 10) were evaluated by immunohistochemistry using antibodies specific for human IL-33 and ST2. Lesion samples were further analyzed by double immunofluorescence to assess IL-33/ST2 co-expression.

Results The numbers of IL-33- and ST2-positive fibroblasts were significantly higher in periapical lesions compared to healthy periapical tissues (both P < 0.05), while the numbers of IL-33- and ST2-positive endothelial cells were similar (both P > 0.05). There were no significant differences in the numbers of IL-33- and ST2-positive fibroblasts and endothelial cells between periapical granulomas and radicular cysts (all P > 0.05). Similarly, numbers of ST2-positive mononuclear cells did not differ between periapical granulomas and radicular cysts were IL-33 positive, while the small proportion of epithelial cells was ST2 positive. Double immunofluorescence analysis revealed IL-33/ST2 co-expression in fibroblasts and endothelial cells.

Conclusions IL-33 and ST2 are expressed in periapical granulomas and radicular cysts. Increased numbers of IL-33- and ST2-positive fibroblasts in periapical lesions when compared to healthy periapical tissues suggest that IL-33/ST2 signaling may be involved in periapical inflammation and tissue fibrosis

Acknowledgements This study was supported by grants from the Serbian Ministry of Science and Technological Development(OP 175071)

GE123

E. faecalis biofilm incidence in apexes of patients with refractary apical periodontitis *Martínez LC, Méndez MV, Aragón A, Juárez F, Silva-Herzog D, González AM Facultad de Estomatología Maestría en Endodoncia, Universidad Autónoma de San Luis Potosí, San Luis Potosí, Mexico **Aim** To Asses the prevalence and presence of monospecies and multispecies Biofilm, from apex of teeth with persistent infection submitted to periapical surgery

Methodology 35 apexes were collected from previously selected patients submitted to periapical surgery due to a persistent apical periodontitis. The samples were sectioned into two pieces that were classified in two groups. Group A: pieces were used to identify the microorganism by a biochemical profile expression. Group B: pieces were processed to be observed by scanning electron microscopy (SEM) to confirm the presence of Biofilm.

Results Group A: Bacterial development was observed in all the 35 samples, 12 (34%) were monospecies and 23 (64%) were multispecies. E. faecalis was the microorganism with higher prevalence; it was identified in 9 out of 35 cases. From the 9 cases identified with E. faecalis , 7 were monospecies. Group B: Biofilm was observed in all samples analyzed by SEM, showing different development stages.

Conclusions In conclusion, our findings confirm the presence of E. faecalis as a predominant pathogen in persistent infections; monospecies biofilms showed a higher prevalence compared to previous apex cultivation studies. Different stages of Biofilm and apex types were observed in the SEM analysis.

GE124

Keratin producing odontogenic cyst with premalignant changes: an unusual presentation affecting a teenager.

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Aim To present a malignant transformation in a jaw cyst, which is a extremely rare situation, although for a long time is generally known that the odontogenic epithelium of cysts can give rise to neoplasms of odontogenic and nonodontogenic nature.

Methodology Keratin-producing odontogenic cysts (KPOCs) form a heterogeneous group of cystic lesions that are often aggressive in character, with high rates of recurrence and multifocality. The lesional spectrum of KPOCs includes odontogenic keratocysts, that according to last World Health Organization (WHO) guidelines are also referred to as keratocystic odontogenic tumors (KCOTs), in accordance with the fact that KCOTs are true tumoral growths. Effective management of these cystic lesions is subject to frequent discussion and malignant transformation is posible, albeit very rare, existing evidence that keratin metaplasia in the epithelium lining of odontogenic cyst may frequently precede the development of carcinomatous change.

Results In the present report we documented as KPOCs may undergo premalignant changes in carcinomatous sense, sometimes in a short period of time after a possible incomplete resection or cystic recurrence, and how this transformation can occur even in young adolescents, highlighting the importance of histopathological examination of all resected cystic lesions of the jaws. **Conclusions** It is very important to perform a careful histopathological examination of all excised odontogenic cysts in order to detect early malignant alterations. A post treatment patient follow-up in KCOT is needed.

GE125

Effects of Calcium Hydroxide and N-acetyl cystein on Destruction Enzyme Activity in Inflamed Cells *Aslantaş EE¹, Doğan Buzoğlu H¹, Ceyhan D², Akkaya Ulum YZ³, Peynircioğlu B³, Aksoy Y⁴ ¹Department of Endodontics, Hacettepe University Faculty of Dentistry, ²Department of Medical Biochemistry, Hacettepe University Faculty of Medicine, ³Department of Medical Biology, Hacettepe University Faculty of Medicine, ⁴Department of Medical Biochemistry, Hacettepe University Faculty of Medicine, Ankara, Turkey **Aim** To evaluate the effects of N-acetylcysteine (NAC) and Calcium hydroxide (Ca(OH)2) on the levels of Matrix metaolloproteinase-2, -9 (MMP-2, -9) and Tissue inhibitör metalloproteinase (TIMP-1, -2) in lipopolysaccharide (LPS) stimulated human macrophage cell line.

Summary THP-1 human monocyte precursor cells were differentiated into macrophage adherent cells. Macrophage cells was stimulated with LPS for 24 hours and then incubated with NAC or Ca(OH)2 for time periods of 6, 24, 48 and 72 hours. Following incubation; protein expression and mRNA levels of MMP-2,-9 and TIMP-1,-2 were evaluated using the enzyme-linked immunosorbent assay (ELISA) and real time-polimerase chain reaction (qRT-PCR). The data were statistically analyzed by two-way ANOVA followed by Bonferroni test at α =0.05

While Ca(OH)2 and NAC reduced MMP-9 protein and mRNA levels at 24. hour and increased at 48. hour following treatment when compared with the control group; NAC increased TIMP-1 mRNA and protein levels at 48. hour. MMP-2 protein level was not detected at 6. hour and was still very low as being statistically unsignificant following time intervals for both experimental materials. On the other hand, Ca(OH)2 and NAC reduced MMP-2 mRNA level and increased TIMP-2 mRNA level first 24 hour. Similar to MMP-2, TIMP-2 protein expression was very low in all groups and statistically unsignificant.

Key Learning Points

• An anti-inflammatory and antioxidant molecule NAC decreased the metalloproteinases and increased the inhibitor metalloproteinases in different time intervals similar to Ca(OH)2.

• It might be considered an alternate candidate therapeutical agent to Ca(O



Immunohistochemical evaluation of the response of the fibroblasts with respect to the evolutive stage of the granulomatous lesions

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Aim The aim of our study is to approach another granuloma component, namely the autochthonous cells of the periapical tissues, which are represented by cells with mesenchymal origin which form the various populations of fibroblasts residing in the periodontal ligament, but which are functionally involved in the turnover of the cement or of the alveolar bone, and thorugh the specificity of the antibodies used, to emphasize the existence of intercellular interactions between the resident cells with mesenchymal and epithelial origin, and the proinflammatory mobile cells.

Methodology Formalin-fixed paraffin-embedded sections from 27 periapical granulomas were used to perform immunohistochemical reactions using antibodies which are specific to the cells with mesenchymal – vimentin origin, α -sma and FSP1 (S100A4)

Results At the level of granulomatous lesions displaying acute inflammatory aspects, we noticed an extremely discrete reaction for vimentin, present only at the peripheral level of the lesion, marking the elongate fusiform cells, placed among the collagen fibers which form the pseudocapsule of the lesion. The α -sma positivity was well represented, especially in the cases of the lesions with fibrotic aspect or in the fibrotic areas of the evolutive lesions. The results obtained for the FSP1 antibody mark an extremely intense positivity, with high incidention, for this antibody, both at the periphery of the studied granulomas and in the central area. The cases of granulomas presenting significant occurance of collagen fibers and few cells, with fibrous scarring aspect, were marked by the lack of positive vimentine cells and plenty of positive cells for FSP1 and

Conclusions The immunohistochemical reactions presented different markings for fibroblasts with respect to the evolutive stage of the granulomatous lesion and the lesionary area studied.

The myofibroblasts were sporadically present in the granulation tissue, but they were not missing from the peripheral areas, in any of the evolutive stages.

Considering the low levels of multiplication capacity of the fibroblasts in the PDL, the high number of myofibroblasts might be determined by the differentiation of other cells, with the biological aim not only of replacing the cells with were injured by the inflammatory process, but also of resuming the turnover of the extracelular matrix.

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The Role of homeostasis MMP-8 and TGFβ1 in Periapical Bone Resorption *Wahjuningrum DA, Rulianto M, Karlina S, Mooduto L Department of Conservative, Airlangga University, Surabaya, Indonesia

Aim The aim of this study was to analyze the role of MMP8 and TGF β 1 to balancing in periapical bone resorption.

Methodology With Posttest only controlled group design, 21 of the three groups of male Rat Wistar were subjected. Chronic Apical Periodontitis was induced by exposure intrapulpa injection of 2 microliter PgLPS1435/1450 (1,0µg/ml) in aquades solution for three weeks on first upper molar. Group (P1) inducted LPS Pg, group (P2) got just LPS Pg solution and (Po) as control. After induction each subject was analyzed by MMP8 and TGF β 1 expression using immunohistochemistry assay. Data were analyzed using one-way Analysis of Variance (ANOVA) and Turkey's test statistics. **Results** The results showed expressions MMP8 and TGF β 1 in group P1 which were significantly different from group P2 p = 0,001*(p<0,05).

Conclusions Macrophage expressing MMP8 and TGF β 1 may play an important role in balancing the destructive mediators in chronic apical periodontitis.

Trauma/Regeneration

GE130

Clinical effectiveness of Platelet Rich Plasma in wound healing - A Case Report Chopra HC, *Chopra VC Department of Periodontics, Oman Dental College, Muscat, Oman

Aim The aim of this case report presentation is to emphasize on the advantages and efficacy of Platelet Rich Plasma in rapid healing and bone regeneration in a periapical defect in surgical endodontics. This presentation shows a clinical case that describes preparation and application of PRP in order to stimulate regeneration o osseous and epithelial tissues. PRP has proven to be effective at improving surgical results in variety of procedures in endodontics, oral and maxillofacial surgery and also in periodontal regenerative therapy. Due to their therapeutic potential, soluble protein factors(BMP's & GF's) have generated considerable interest during the past few years. PRP has become a valuable adjunct in wound healing in dentistry. Surgical sites enhanced with PRP have been shown to heal at rates two to three times that of normal surgical sites.

Summary Wound healing is a complex and growing science. The field of transfusion medicine, as it applies to wound healing and the formation of an autogenous platelet gel, still is a young scientific field in which many discoveries have to be made. Platelet rich plasma is a material of interest which could serve as potentially viable scaffold material as it is rich in pre-existing growth factors like platelet derived growth factors (PGDF), transforming growth factor-beta, is biodegradable and easy to prepare in dental setting. This case report shows the rapid effect of PRP and hydroxyapatite in bone regeneration when placed collectively in a non-healing periapical defect. This presentation also showcases the preparation of PRP in a dental setup and its applications in dentistry. With PRP there is also potential for an immense host of medical/surgical applications. while further research is necessary to corroborate the results of PRP shown in this case report, this approach may serve as a basis for additional innovations in regenerative technologies.

Key Learning Points

- Selection of case for Surgical endodontics.
- Significance of PRP in wound healing and Bone regeneration.
- Preparation of PRP in a dental setup.
- Clinical applications of PRP in dentistry.
- Advantages of PRP over other Bone regenerating Materials.

The influence of immunological profile in the success of avulsed and replanted teeth during 5 years of follow up

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Aim The maintenance of a tooth in its socket is the goal of replantation after dental avulsion. Factors that influence prognosis include the maintenance of viable cementoblasts, prevention of infection, endodontic treatment, use of systemic medication, follow up and immunological response. The tooth loss and root resorption are related to the intensity and aggressively of the inflammatory response next to replantation. The Th2 anti-inflammatory profile may be a protective factor. Therefore, the aim of this study was to evaluate, for five years, the outcome of replanted teeth that followed or not the IADT (International Association of Dental Traumatology) guidelines in non-atopic and atopic patients, representing the Th2 predominantly immunological profile.

Methodology Sixty-two avulsed and replanted teeth between the years of 2003-2008 were assessed. Five years after replantation, clinical and radiographic examinations were performed. The evaluation of atopy was based on patients' personal and family histories in conjunction with a skin prick test for 5 allergen extracts.

Results The 31 teeth that remained in their sockets, 16 (51.6%) were of atopic patients whose tooth replantation followed the IADT guidelines, and 8 (25,8%) were of non-atopic that follow IADT; 1 (3.2%) of atopic that did not followed IADT and 6 (19,4%) of non-atopic that did not follow IADT. **Conclusions** The results show the improvement in maintaining the replanted teeth after 5 years of follow up in patients with a predominantly Th2 immunological profile that followed the IADT guidelines.

GE132

Therapeutic validity of regenerative pulp treatment strategies: bioactivity or specificity? *Kodonas K¹, Gogos C¹, Papadimitriou S², Tziafas D¹

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Aim This presentation aims to review critically, traditional and novel experimental observations of direct relevance to the ability of odontoblast-like cell differentiation signaling, together with pertinent published experimental data from usage tests in the mechanical pulp exposure model. **Summary** It is well-accepted that nature and specificity of pulp responses to various treatment modalities are of particular importance for the determination of the therapeutic validity of capping agents. Differentiation of odontoblast-like cells and reparative dentin formation is the blue-print of any vital pulp treatment strategy aiming to regeneration of the dentin-pulp complex. Traditional vital pulp treatment modalities have repeatedly showed that focal deposition of reparative dentin is preceded by deposition of an osteotypic scar-like tissue, indicating that reparative dentin formation does not always represent true induction of dentinogenesis, but rather constitutes part of the wound healing mechanism at pulpal injury sites. During the last 2 decades, bioactive treatment modalities on molecule-based tissue engineering approaches are designed and pre-clinically tested. However, evaluation of bioactive potential in these tests is mainly based on formation of hard tissue bridge vs the de novo initiation of tertiary dentinogenesis. In this context, further research on the regenerative pulp treatment strategies requires re-consideration of their evaluation protocols. Critical parameters, such as the nature of delivery vehicle, dose response effects, etc. should only be evaluated in relation to their therapeutic validity. Criteria might be based mainly on application's specificity (defined as its ability to signal directly odontoblast-like cell differentiation and tubular

reparative dentin formation at a desired spatial pattern and time scale) instead of its bioactivity potential.

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GE133

Medicaments used in endodontic regeneration technique. *Esteve H, Pascual J, Ramírez A, Durán F Department of Endodontics, Universitat International de Catalunya, Sant Cugat del Vallès, Spain

Aim Reviewing the most effective intracanal medication to achieve good disinfection prior to regeneration techniques, either by root canal revascularization via blood clotting, postnatal stem cell therapy, pulp implantation, scaffold implantation, injectable scaffold delivery, three-dimensional cell printing and gene delivery.

Methodology An in-depth search of the literature was undertaken to review articles concerned with regenerative procedures and revascularization and to glean recommendations regarding the indications, preferred medications, and methods of treatment currently practiced.

Results The most frequently used drugs were the trilpe antibiotic paste (ciprofloxacin, metronidazole and minocycline), double antibiotic paste (ciprofloxacin and metronidazole o ciprofloxacin, metronidazole y cefaclor) and Ca (OH). In a reference was found Formocresol, in another it was not put anything and another Augmentin

Conclusions Regenerative endodontic techniques are based on the basic tissue engineering principles that include steam cells therapy, growth factors, and scaffolds. Attempts to regenerate pulp tissue under conditions of inflammation or partial necrosis have proved unsuccessful.

It is necessary to disinfect the root canal and remove infected systems hard and soft tissues before using regenerative endodontic treatments, the choice of an irrigant is of great Importance, but it is not sufficient.

Triple antibiotic combination of ciprofloxacin, metronidazole, and minocycline by mixing equal doses with sterile saline paste-like consistency is sufficiently potent to eradicate bacteria from the infected dentin of the root and romote healing of the apical tissues.

Acknowledgements My tutors Anaïs Sebastià Ramirez and Javier Pascual Irigoyen for being so patient with me.

GE134

Apexification and revascularization of immature permanent molar rats with pulp necrosis and apical periodontitis. Part I: Radiographic outcomes.

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Aim The purpose of the present study was to compare the radiographic outcomes of apexification (AP) and revascularization (RV) in immature molar teeth of rats with pulp necrosis and apical periodontitis.

Methodology Forty lower first molars of 4-week old Wistar rats were used. Access cavities were drilled and were left unsealed for 3 weeks for induction of pulp necrosis and apical periodontitis, which was confirmed radiographically. The rats were then divided into 4 groups (n = 10) according to the treatment proposed: NC (negative control) - did not receive further treatment; AP (apexification) – the root canal was irrigated with 2.5% sodium hypochlorite and filled with calcium hydroxide

paste; RV (revascularization) - the specimens received the same treatment as in AP followed by revascularization procedures for a period of 2 weeks; PC (positive control) – to allow physiological continuity of root development, teeth in this group did not have an access cavity drilled or received any further treatment. After the period of 6 weeks, the animals were euthanized and the teeth were radiographed for assessment of changes in the apical lesion size, in the diameter of the apical foramen, root length, and dentine wall thickness in the mesial roots.

Results Reduction in the apical lesion size was identified in both AP (7/10) and RV (8/10) and no statistical difference was identified between these 2 groups (P > 0.05). Decrease in foramen diameter, increase in dentin wall thickness and in root length were only shown in RV and PC with statistical difference (P < 0.05) only in dentin wall thickness (PC > RV).

Conclusions Although both AP and RV procedures lead to decrease in apical lesion size, only RV allowed for continued root development.

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Management of complicated crown fracture and subluxation of maxillary central incisors with closed apices.



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AIM

The aim of this clinical poster was to report a dental trauma case of both maxillary central incisors, with reattachment of the teeth fragment in one case and non vital bleaching with sodium perborate in the other one.

INTRODUCTION

A complicated crown fracture consists in a enamel and dentin structure loss and pulp expossure. On the other hand, subluxation is caused by an injury to the supporting structures resulting in increased mobility with no tooth displacement.

CASE PRESENTATION

A 17 years old male suffered a dental injury causing subluxation of the right maxillary central incisor and complicated crown fracture of the left maxillary central incisor. Both central incisors showed multiple fissure lines in the buccal aspect of the crown. The patient provided the dehydrated tooth fragment, which was introduced into saline solution for rehydration. Time between injury and treatment was less than 12 hours. Both teeth presented closed apex. Root canal treatment of the left central incisor was carried out, and itwas restorated with the tooth fragment and the fissure line with resin composite.



One month later, right central incisor presented changed colour and negative vitality, therefore, root-canal treatment followed by non-vital whitening with sodium perborate were performed. Both cases were instrumented with the rotatory system Mtwo[®] and irrigated with 4.2% NaOCI, 17% EDTA and a final rinse with 4.2% NaOCI, activated with Endoactivator[®]. Roots canal were obturated using Calamus[®], Autofit[®] guttapercha and AH Plus[®] sealer.



CONCLUSIONS AND CLINICAL RELEVANCE

Clinical and radiographical controls are necessary in dental traumatology, because this injury can cause a vascular disorder into the apex and therefore pulp necrosis could appear. Actual adhesion techniques allow to restore tooth by fragment attachment with a predictable prognosis.

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Endodontic management of a RHF in 2.1 with incomplete root development *Escribano B, Micó P, Manzano A, Giner T, Collado N Department of Dentistry, Endodontics, Valencia, Spain

<u>Aim</u>: Demonstrate with a clinical case that with a radicular horizontal fracture of 2.1 with necrosis and abscess, we only have to treat the coronal segment. The apical segment usually supports pulp vitality. In this case, the root had a non complete anatomy, and it formed later.

<u>Abstract</u>: A 12 year old patient with epilepsia precedents came to the UE of Valencia clinic with an abscess in 2.1. This patient had tooth splinting because of a radicular horizontal fracture with pulp vitality. We decided to treat just the coronal segment, inducing the creation of an apical barrier with calcium hidroxide. Later on, and because of the loss of the provisional coronal sealer, the patient came with a fistula. We placed calcium hidroxide again, obtaining a positive evolution, disappearing the fistula and obtaining a barrier at the coronal segment. This way we could do a correct sealing with gutta-percha. At the same way, we managed bone reparation at the fracture level and a fracture callus. The apical segment, which had not completed yet, did continue its development with pulp vitality.

Key Words: Horizontal root fracture, incomplete root development, bone repair, fracture callus.



Bibliographic review on decoronation in avulsion, about a case *Fernandez V, Garrido I, Durán F Departament of endodontic, International University of Catalunya, Barcelona, Spain., Barcelona, Spain

Aim The ankylosis is an important consequence of avulsed teeth. Because of this importance I have done a literature review to justify current studies that clarify the treatment plan and prognosis of these teeth when doing decoronation. I am presenting a case.

Case presentation Decoronation of central incisor in 15 years child with root replacement resorption. Ankylosis followed by tooth extraction would lead to further loss of bone In order to keep the width of the alveolar bone prior to the implant placement a decoronation is required. Summary Dentoalveolar ankylosis of a tooth is a serious complication in growing individuals. The ankylosed root is continuously resorbed and replaced by bone, and an infraposition of the damaged tooth will develop. The alveolar ridge was maintained, and the bone level increased after decoronation in patients treated before or during pubertal growth periods. The clinical finding is that decoronation can maintain or reestablish normal alveolar conditions is important for successful implant insertion later.

This case report describes the decororonation for preserving the alveolar crest until the child is old enough to get an implant.

Key Learning Points

- Ankylosis is a common complication when the periodontal ligaments are damaged. The consequence is fusion of the alveolar bone and root substance.
- Dento-alveolar ankylosis is clinically the condition most often seen as a complication in avulsed teeth that have been out of the mouth long enough for the cells on the root surface to dry out and die.
- The idea was to remove the crown and the root filling and maintain the resorb ing root as a matrix for new bone development.





A multi-disciplinary Approach in The Management of a Traumatized Tooth With Complicated Crown-Root Fracture: A case report



Beyza ÖZIŞIK, Önder GÜRLEK, Tuğba TÜRK

EGE University, Department of endodontics

Aim

The purpose of this case prese complicated crown-root fracture nt of ma

Introduction

pot fracture is defined as a fra nplicated or uncomplicated an in the permanent dentition, cro and cementum and may be classified as nent . While crown fractures occur most involving enamel, ng to the pulpal i in the per

Case Presentation

ar-old boy applied to dental clinic k use of luxation at the crown of to oth number 21 and spo as administered and the coronal segment was remo ed with minimal force from its soft tissue attachment and ed in sterile distilled water to pre ydration. The working length was determined with an electronic ts, obturated using cold lateral co tion technique. After root canal fill pared by fiber class post drill. Acid-etch was applied to coronal fragment and post space. Post and c

Discussion

Conclusions and Clinical Relevance













.Morfis AS. Vertical root frac

1 month follow-up

1 year follow-up



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After hours presentation of non-adults in a university hospital in 2012 due to trauma *Weusmann JW, Mahmoodi BM, Azaripour AA, Braun BB, Willershausen BW Department of Operative Dentistry, University Medical Center of the Johannes Gutenberg-University Mainz, Mainz, Germany

Aim In childhood and adolescence, traumatic injuries of the oral area are one of the most common reasons for the consultation of the dental after hour service. This survey gives an overview on the prevalence of the different manifestations and its distributions in non-adult patients presenting due to dental trauma at an out-of-hours dental service at a university hospital in Mainz, Germany. **Methodology** All files of the patients aged <18 years introducing due to dental trauma in the year 2012 were extracted from the hospital database and were reviewed regarding the affected teeth, the time of consultation, gender and patient age as well as the conducted treatment.

Results Out of 754 out-of-hours patients <18 years, a total of 241 non-adults (P = 106; $\sigma = 135$; 44.0% vs. 56.0%) received treatment due to dental trauma. The mean age of this group was 6.8±4.5. 50.2 % of the patients came on Saturdays or Sundays. Altogether, 375 teeth were affected. In 129 cases (53.5%), only one tooth was traumatized, in 76 (31.5%) two teeth and in 28 (11.6%) three or more teeth were injured. In 53.5% only milk teeth were injured, in 42.3% the permanent dentition was affected; 1.2 % both. Seven patients (2.9 %) had no tooth involvement.

Most common trauma was the lateral luxation (27.0%) followed by subluxation (20.3%) and uncomplicated enamel-dentin-fracture (18.7%).

In 40 cases (16.6 %) a temporary filling was applied, 35 (14.5%) patients were splinted. 14 teeth were extracted.

Conclusions Traumatic accidents of the stomathognathic system remain a main reason for seeking the help of a dentist in childhood. One third of our non-adult patients came due to dental trauma. The high number of trauma cases in this age group shows the need to educate all caregivers of children on the prevention of dental injuries. Especially parents and teachers should receive instructions to better avoid and manage dental trauma.

GE141

Decoronation in ankilosis, literature review and case presentation *fernandez V Universidad Internacional Cataluña, Departamento de Endodoncia, Barcelona, Spain

Aim The objective is remove the crown and the root filling. Perform a blood clot in the root canal system for maintain the resorbing root as a matrix for new bone development.

Methodology Avulsed teeth that are stored extraorally in a dry environment for >60 min generally develop replacement root resorption or ankylosis following their replantation due to the absence of a vital periodontal ligament on their root surface. One negative sequelae of such ankylosis is tooth infra-positioning and the local arrest of alveolar bone growth. Removal of an ankylosed tooth may be difficult and traumatic leading to esthetic bony ridge deformities and optimal prosthetic treatment interferences. Treatment option for ankylosed teeth named 'de-coronation' gained interest, particularly in pediatric dentistry that concentrated in dental traumatology. This article reviews the up-to-date literature that has been published on decoronation

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Conclusions Treatment option for ankylosed teeth named 'de-coronation' gained interest, particularly in pediatric dentistry that concentrated in dental traumatology. This article reviews the up-to-date literature that has been published on decoronation

Acknowledgements Words : Ankylosis, avulsion, replacement resorption, decoronation.

GE142

Evaluation of intracanal acetazolemide in late reimplanted rat teeth *Perin CP, Westphalen VPD, Carneiro E, Fariniuk LF, Silva Neto UX, Matttos NHR, Hirai VHG Department of Endodontics, Pontificia Universidade Catolica do Paraná - PUC PR, Curitiba, Brazil

Aim Therapy indicated for avulsed teeth is immediate reimplantation if possible, otherwise late reimplantation, when substitutive root resorption may frequently occur due to periodontal ligamentloss. Since calcium hydroxide, the most used intracanal medication, does not prevent this type of resorption, Acetazolamide has been suggested for this purpose. In this study, the aim was to evaluate acetazolamide associated with calcium hydroxide as intracanal medication in avulsed late reimplanted rat teeth.

Methodology In 100 Wistar rats, divided into 5 groups, five medications were implanted: Group 1: acetazolamide liquid (AL); Group 2: acetazolamide liquid + calcium-hydroxide powder (ALHC); Group 3: acetazolamide powder + acetazolamide liquid (APAL); Group 4: acetazolamide powder + physiological solution (APSF); Group 5: Calcium hydroxide powder + physiological solution. At 30 and 60 days after reimplantation, animals were sacrificed, and cuts stained with hematoxylin and eosin. The following percentages were quantified under optical-microscope: a) inflammatory root resorption (IRR); b) substitutive root resorption (SRR); c) presence of ankylosis. Data were compared by Kruskal-Wallis test at 5% significance-level, and Dunn multiple-comparisons test.

Results No statistical difference was found: a) between 30 and 60 days, for the variables IRR and SRR; b) between Group x Time for variable IRR; c) group 1 (ALHC) presented higher SRR, differing statistically from group 5 (C), at 60 days; other groups did not differ statistically among them d) as regards ankylosis, group 1 (AL) showed lowest presence of ankylosis at 30 days, differing statistically from other groups.

Conclusions It was concluded that AL Group not only presented results similar to the calcium hydroxide Group, as regards substitutive resorption (SRR), but also demonstrated less ankylosis when compared with the same group at 30 days, suggesting this medication for late reimplanted avulsed teeth. The combination ALHC showed worse results for the treatment of SRR than the control group.

Management of horizontal root fractured anterior central incisors with BioAggregateTM : a Case report

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Aim

Management of horizontal root fractures with dislocated coronal fragments caused by dental trauma using BioAggregateTM was presented.

Case Report

A fifteen-year-old male forensic case referred to Endodontic department caused punch injury of his face after 3 hours. Clinical findings were ecchymosis and edema in his face, and coronal segments of 11 and 21 (FDI) teeth were displaced. Gingival bleeding in these teeth was also observed intraoral examination. Horizontal fractures at mid-third of roots and dislocated coronal segments were determined in X-ray in 11 (FDI) and 21 teeth. Following the receipt of legal procedures, dislocated coronal fragments were replaced with finger pressure under local anesthesia. The semi-rigid splint applied with 1x3 twisted wire (Corp® 3M Unitek, Monrovia, Canada) and light cured composite resin. The resorptions were seen in coronal sections of the fracture line at the $4^{th}\mbox{-week}$ follow-up in X-ray and the splint was removed. After partial pulpectomy were done in these teeth till the fracture line using BioAggregate[™] (Innovative BioCeramix, Vancouver, BC, Canada) in onestep. The recall periods were at 8th-week, 4th-month, 6thmonth and 12th-month.





Initial photograph and X-ray of 11-21 (FDI) teeth







8th-week follow-up photograph and X-ray of 11-21 (FDI) teeth

-month follow-up photograph and X-ray of 11-21 (FDI)

Key learning points

•Partial pulpectomy helps to survive the pulp of apical fragmant

•Bioaggregate[™] would be effective material for treating root resorption caused by dental trauma

Biocompatability

GE144

Expression of integrin $\beta\mathchar`-1$ and vinculin as cellular adhesion markers on retrograde obturation materials

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Aim Aim To assess the expression of integrin B1 and vinculin as cellular adhesion markers of three materials for retrograde obturation at 1 hour, 5 and 10 days.

Methodology Methodology viability and proliferation of fibroblasts from oral mucosa was evaluated. Expression of adhesion proteins integrin-B1 and vinculin was also evaluated and focal expression was measured by fluorescent microscopy.

Results Results higher expression was found with MTA group, followed by Super EBA and IRM. IRM showed the lowest focal adhesion levels

Conclusions Conclusion MTA showed the highest levels for protein expression and focal adhesion when compared to Super EBA and IRM. This result suggests good biocompatibility for MTA as it showed the highest level of adhesion.

GE145

Evaluation of cytotoxicity of sealers EndoSequence BC and AH Plus *Ledesma RS, Soto A, González AM, Pozos AJ, Escobar D, Méndez MV Facultad de Estomatología Maestría en Endodoncia, Universidad Autónoma de San Luis Potosí, San Luis Potosí, Mexico

Aim Aim Evaluate the cytotoxicity of sealers EndoSequence BC and AH-Plus on human periodontal ligament fibroblasts.

Methodology Methodology 15 fibroblast cultures of human periodontal ligament obtained from third molars were observed with different sealers and a freshly mixed control at 2, 4 and 24 hours. Cell viability with trypan blue 30 ml and 10 ml and cell count was performed using a

hemocytometer. Reduction assay was conducted with the MTS kit AQuenous CellTiter 96R Non-Radioactive Cell Proliferation Assay (Promega). Assay was performed in 33 wells, 20 with a mixture (Sealer+medium+40 000cells for wells + MTS/PMS); 10 Negative controls; 2 Reactive controls; 1 blanc (medium + MTS/PMS) . Subsequently, an osmolality test was performed. Fibroblasts of human periodontal ligament were cultured for 24 hours and 6 tubes were set (4 mixture and 2 controls). Sealers were kept by 4 hours in direct contact with the cells and evaluated by using a cryoscopic osmometer (Criobasic 1) with a cooling temperature of -1.86 C.

Results Results Cell counting and trypan blue viability by 2 hours showed zero cells for AH Plus, 4500 for EndoSequence BC, and 26 500 for the control group. At 4 and 24 hours EndoSequence BC and AH Plus showed no cells. The MTS reduction assay showed no cell viability for both EndoSequence BC and AH Plus. Osmolality test results showed 415.2 mOSM for AH Plus, 831.5 mOSM for EndoSequence BC, and 474.5 mOSM for the control group.

Conclusions Conclusions At two hours, AH Plus showed greater toxicity, however at 4 hours both sealers demonstrated to be cytotoxic. EndoSequence BC produces a hypertonic solution so that cells die dehydrated.

Other

GE146

Level of "stress" and confidence in the transition of endodontics pre-clinic to clinic Fonseca M1, Silva AR¹, Elemam RF¹, Teixeira V¹, Noites R², *Pina-Vaz I³ ¹Faculty of Dental Medicine of University of Porto, Porto, ²Endodontics, Portuguese Catholic University, Viseu, ³Endodontics, Faculty of Dental Medicine of University of Porto, Porto, Portugal

Aim To determine the level of "stress" and confidence of undergraduate students in the transition of pre-clinic to endodontic clinic in the School of Dental Medicine, University of Porto, Portugal. **Methodology** 72 undergraduate students in the 1st semester of the 4th year in a total of 86,were enrolled (27 males and 45 females). They answered a survey at the middle of the first semester. The questionnaire was testing the level of confidence of the students in the clinical situation of the next semester. Furthermore, a small group of 20 students voluntarily joined a course in the clinic, with the purpose of getting used to the challenges they will face in the following semester. **Results** Most students show a good level of confidence. However a high level of stress was also observed due to lack of free time, excess of work and fear of failing. The signs and symptoms of stress such as anxiety, physical fatigue, drowsiness, tension and irritability were the most prominent amongst the students. The students who joined the program, in their majority female, had a higher level of stress compared to those who didn't participate. There was no difference in the level of confidence between them.

Conclusions The high level of confidence displayed may indicate a lack of understanding of the reality of the clinical work. On the other hand the ones that were more conscious of the difficulties they would face and that presented more stress were the ones that signed in voluntarily. First exposure to dental clinic produces a stressful experience to dental students thus an observational program can be a way to help them to get a better sense of reality.

GE147

Using a single pair of gloves for the entire endodontic procedure increases the likelihood of contaminating the root canal.

*Vincer LM¹, Niazi SA², Mannocci F¹

Department of ¹Endodontology, ²Restorative Dentistry, Dental Institute, King's College, London, London, United Kingdom

Aim To determine the bacterial load sampled from a single pair of gloves at different time-points during endodontic treatment and to identify the most prevalent bacteria sampled from the gloves. **Methodology** The dentist performing the root canal treatment wore a single pair of gloves. The gloves were sampled using a sterile swab at four time-points during the procedure. The samples were serially diluted and plated onto the Fastidious Anaerobe Agar (FAA) supplemented with 5% [v/v] horse blood (Lab M, United Kingdom). After incubation, colonies were counted and a predetermined number of colonies (n=30 maximum per patient) were randomly selected and subcultured for identification. Primarily, PCR-based 16S rRNA gene sequence analysis using universal primers (9F, 907r) was used for bacterial identification followed by recA gene sequencing. The partial gene sequences were identified by a BLAST search of the NCBI database (http://0-www.ncbi.nlm.nih.gov.ilsprod.ilb.neu.edu/BLAST/) and Human Oral Microbiome Database (http://www.homd.org/).

Results There was a progressive increase in the bacterial load of the gloves worn during the root canal treatment session. 382 isolates belonging to 36 cultivable bacterial taxa were identified. The mean number of the bacterial species recovered from the gloves samples was 16.7 ± 5.7 . Grampositive facultative anaerobic organisms (n = 31) mainly dominated the microbiota of these gloves. P. acnes type II was the most prevalent isolate recovered.

Conclusions The present investigation shows that bacterial load on gloves increases during the endodontic treatment. In view of this, gloves should be changed regularly throughout the procedure thereby reducing the risk of root canal contamination during endodontic treatment.

GE148

Evaluation of oral conditions of women born to mothers diagnosed with Diabetes Mellitus *Leonardi DP, Luzzi T, Brancher JA, Tomazinho FSF, Baratto-Filho F Masters of Science Program in Clinical Dentistry, Positivo University, Curitiba, Paraná, Brazil

Aim To assess the oral conditions from women without Diabetes mellitus (DM) born to mothers with type 1 or 2 DM diagnosis.

Methodology The study sample comprised 83 Brazilian women divided into 2 groups: G1 included 34 women (39.91 ± 11.47 years-old) born to mothers with DM and G2 included 49 (32.95 ± 11.17 years-old) healthy women. Information about systemic health condition were collected. Clinical and radiographic examinations were performed by PhD endodontists. The subjects were diagnosed according to the decayed, missing, and filled teeth index (DMF-T); teeth present in the oral cavity; periodontal disease; periapical lesions and teeth with endodontic treatment. The variables were analyzed with the Lilliefors test. The homogeneity of variance was assessed with the Levene test. **Results** G1 had a significantly greater DMF-T index (17.4 ± 7.9) than G2 (11.8 ± 7.6 ; t = 3.201, p = 0.002). Regarding the presence of teeth, G1 had fewer teeth (24 ± 7) than G2 (27 ± 5 ; U = 1,102, p = 0.012). The frequency of periodontal disease was higher in G1 than G2, 50% vs. 20.4%, respectively. There were significantly more teeth with endodontic treatment in G1 (2.02 ± 1.5) than G2 (0.87 ± 1.2 ; U = 457, p = 0.000). Meanwhile, the frequency of periapical lesion frequencies was higher in G1 (76.5%) than G2 (34.7%).

Conclusions This study revealed that oral conditions of women without DM born to mothers diagnosed with DM are worse than healthy women suggesting an association between systemic disease of mothers with the oral health status of daughters.

GE149

Assessment of Dentists' Referral Pattern to Endodontist in Turkey *Ozcan O, Kalyoncuoglu E Department of Endodontics, Ondokuz Mayis University, Samsun, Turkey

Aim To determine the criters of endodontic referral from general practitoners in Turkey. **Methodology** A questionnaire, containing 28 questions, was designed to determine the need for endodontic referral and the factors that influenced the decision to refer a patient to the endodontists. Survey was sent by mail to the registered dentists in the database of Turkish Dental Association. Blank or twice answered surveys were excluded from the study.

95% confidence to participate in the survey, 655 people were selected \pm 3.7% with acceptable error. Data were analyzed with the statistical software IBM SPSS V21. Categorical data were analyzed with chi-square test and results were presented as frequency and percentage. The significance threshold for all tests was set at .05. Binary comparison of categorical data held in Minitab 15 software package, to comparison Fisher's two tailed exact test was used.

Results The response rate was 5.5% (655). Majority (96.8%) of the respondents performed root canal treatment by themselves and they prefer to refer patient to endodontist (90.8%) when they encounter a challenging case. Statically analyses revealed that female general dental practitioners were referred more patient to an endodontist than males (p<0.05). While limited mouth opening (73.2%) was found to be the most common factor for referral and severe gag reflex (66.4%) was found as the second preffered reason in the patient related factors. External (%54.8) and internal root resorption (%49.9) were the most common referral reasons in the teeth related factors. A statistically negative correlation was found between the professional experience and patient referral (p<0.05).

Conclusions We concluded that, many patient and tooth related factors influence the endodontic referral of patients. For a successful treatment, general dentist should made a proper diagnose and refer to a specialist if necessary.

Fracture risk of endodontic treated teeth during orthodontic movements: case report *Oricchio M¹, Isufi A², Druga K³, De Propris F⁴, Marzo G⁵, Gallottini L⁴ ¹Dentistry, University Sapienza, Rome, Italy, ²Medicine, University of Tirana, Tirana, Albania, ³Private practitioner, Tirana, Italy, ⁴Private practitioner, Rome, Italy, ⁵Dentistry, University De L'Aquila, L'Aquila, Italy

AIM:

the aim of this work is to provide documentary evidence that the root fracture is a possible unfortunate situation that can occurs in clinical practice in trying to move orthodontically endodontically treated teeth.

INTRODUCTION:

Endodontically treated teeth, are structurally different from unrestored vital teeth.

Often in clinical practice there is the need of moving endodontically treated teeth, but those can present a higher degree of root resorption and root fracture. This higher degree can be due to biomechanical reasons like the alteration in the stress distribution pattern within the remaining tooth structure of treated tooth, furthermore the dentin in endodontically treated teeth is more brittle than the dentin in teeth with "vital" pulps because of water loss and loss of collagen cross-linking.

MATERIAL AND METHODS:

The patient is a female, at the time of clinical observation she is 12 years old, she shows permanent dentition, anterior open bite and atypical swallowing. The patient had a traumatic intrusion of maxillary central right incisor at the age of 7 and after this traumatic event was made an immediate endodontic treatment of 1.1.

Clinical exam shows that 1.1 is still intruded and this is the reason that motivate the patient to ask for an orthodontic treatment.

We decided to repositioning 1.1 in his physiological position using a fixed orthodontic appliance (Damon System).

In a first step the metallic Damon brackets were bonded.

The alignment and levelling was done with this arch sequence : 0,13 CuNiTi (8 months), 016 CuNiTi (8 months), 14x25 Cu NiTi (3 months), 18X25 Cu NiTi (3 months), 19X25 SS (3 months).

In the early stages of therapy the orthodontic movement of 1.1 didn't present complications and after 8 months 1.1 was almost completely levelled and aligned.

After 10 months from the start of the orthodontic therapy occurred the root fracture of 1.1.

We extracted the fractured root and 1.1 was replaced with a Maryland bridge. Later was performed the orthodontic correction of anterior open bite.

DISCUSSION:

The risk of root fracture during orthodontic movement of an endodontically treated tooth occurs because the orthodontic forces act on a structurally fragile tooth that responds abnormally to the stress induced during the movements.

CONCLUSIONS:

During an orthodontic treatment that involves a traumatized and endodontically treated tooth ,the root fracture is a possible event that can complicate the therapy .

Influence of Ferrule, Post System, and Length on Biomechanical Behavior of Endodontically Treated Anterior Teeth Journal of Prosthodontic Research Volume 40, issue 1, january 2014, Pages 119-123Paulo César Freitas Santos-Filho, DDS, MS, PhD*., Crisnicaw Verissimo, DDS, MS*, Paulo Vinicius Soares, DDS, MS, PhD*, Rebeca Carniello Saltarelo, DDS*, Carlos José Soares, DDS, MS, PhD*, Luis Roberto Marcondes Martins, DDS, MS,

Endodontically treated teeth: Characteristics and considerations to restore them

Journal of Prosthoontic Reserch Volume 55, issue2, April 2011 Pages 69-74Adriana Cláudia Lapria Faria^{1,}, Renata Cristina Silveira Rodrigues^{2,}, Rossana Pereira de Almeida Antunes^{3,}, Maria da Gloria Chiarello de Mattos^{2,}, Ricardo Faria

Pre-orthodontic treatment situation Panoramic Radiograph



Pre-orthodontic treatment situation Clinical Image



1.1 almost completely aligned and levelled Clinical Image



1.1 extracted and replaced with Maryland bridge Panoramic Radiograph



A young dentists experience of endodontic training in general dental practice *Shankla K, Nolan C Bloxdent General Dental Practice, Bloxdent General dental Practice, Banbury, United Kingdom

Aim To present an oral presentation on the benefits of postgraduate training in the field of endodontics. Portraying a young dentists year long experience having participated in a pilot scheme that aimed to provide dentists with the opportunity to develop and enhance new skills in endodontics.

Summary A pilot scheme, Dental Core Training Primary Care Scheme in Community Dental Services & General Dental Practice commenced in 2014 in the Oxford and Wessex Dental Deanery, United Kingdom. Dental Core Training is a voluntary 12 month programme that aims to provide young dentists with the opportunity to consolidate skills acquired during the foundation year and develop and enhance new skills in specific areas of clinical practice.

Key Learning Points

- Undergraduate endodontic training and how it prepares young dentists to enable provision of endodontic treatment in general dental practice
- Existing pathways for postgraduate training in Endodontics
- Dental Core Training Primary Care Scheme in Commun

GE152

Consumption of antimicrobial agents and self-medication patterns among patients who attended an urgency dental service

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Departments of ¹Conservative Dentistry, ²Pharmacology, Federal University of Rio Grande do Sul, Porto Alegre, Brazil

Aim The aim of the present study was to determine the self-medication pattern among patients from 2011 to 2014, after the Brazilian governmental regulation for the consumption of antimicrobial agents.

Methodology The Ethics Committee in Research approved this observational, prospective and transversal study. A total number of 574 patients were interviewed. Epidemiological data and information associated with the use of antimicrobial agents up to the six months before the interview were recorded. The periods of evaluation were 2011, 2012, 2013 and 2014. Statistical analysis was carried out, regarding the frequency of antimicrobial consumption, storage and disposal, reason for antimicrobial use, reason for auto medication, and frequency of leftovers. **Results** The great majority of patients were adult females. It was observed that 51.97% of the patients had antimicrobial agents during the entire period, and 5.58% reported self-medication. The number of patients that report antimicrobial consumption were 81.3%, 45.5%, 44.82% and 36.29% for 2011, 2012, 2013 and 2014, respectively. Despite the reduction in the antimicrobial consumption rates, an increase in the rates for self-medication was observed from 2011 (6.55%) to 2014 (8.16%). **Conclusions** After a four-year period, the governmental regulation for the consumption of antimicrobial agents allowed reduction in the antimicrobial consumption in a population that attended an urgency dental service.

GE153

Survey on endodontic practice and referral behaviour by Walloon Dentists *Neukermans M¹, De Bruyne M¹, Meire M¹, Vanobbergen J², Siquet JP³, De Moor R¹ ¹Department of Restorative Dentistry and Endodontology, University Of Ghent, Ghent, ²Department of Community Dentistry, University Of Ghent, Ghent, ³Belgian Association for Endodontology and Traumatology, BAET, Brussels, Belgium **Aim** To gather information on endodontic practice aspects and referral behaviour by Walloon (French-speaking Belgian) dentists.

Methodology A survey was attached to the monthly magazine of the French-speaking Dental Society, reaching approximately 2400 active Walloon dentists. The list consisted of 55 multiple choice questions on endodontic practice and endodontic referral need. Basic information on age, gender, year of qualification and clinical specialty was also obtained. The questionnaire could be returned free of charge. Data were imported in a database and subjected to descriptive and analytical statistics.

Results The response rate was 25%. 73% of the respondents were general dental practitioners (GDP's). Nearly 62% of the respondents worked in a solo practice. Well over half of the respondents never or seldom used rubber dam. Likewise, the use of EDTA, magnification and ultrasonic activation of irrigants was limited. The year of graduation played an important role; the younger the respondent, the more frequent was the use of rubber dam, Gates Glidden burs, NiTi rotaries, sodium hypochlorite, EDTA and a hybrid condensation technique. Almost half of the respondents, even within the younger generations, used a single cone obturation technique. Female respondents were more likely to refer for endodontic treatment and minor oral surgery, than their male colleagues. When asked to rate the importance of secondary care, endodontics scored an average of 7.95 out of 10, being the second most important specialism after periodontics. Persistent pain or symptoms, difficult tooth anatomy, open apices, root canal obstruction, retreatment and perforation were identified as important factors for referral by more than half of the respondents. **Conclusions** Endodontic practice of Walloon dentists is not always in compliance with quality guidelines. However, more recently graduated dentists tend to use present-day materials and techniques more frequently. There is a high need for secondary endodontic care.

GE154

Survey on treatment decision making by Walloon Dentists: Retention versus Extraction Meire M¹, *Neukermans M¹, De Bruyne M¹, Vanobbergen J¹, Siquet JP², De Moor R¹ ¹Department of Restorative Dentistry and Endodontology, Ghent University, Ghent, Belgium ²Belgian Association of Endodontology and Traumatology, BAET, Brussels, Belgium

Aim To gather information on the treatment preferences of Walloon (French-speaking Belgian) dentists faced with the choice between tooth retention and extraction. In particular, situations were raised where a tooth could still be retained through root canal treatment (RCT) and extensive, but feasible coronal restoration. Furthermore, the dentists' position relative to some internationally noted guidelines on the subject was inquired.

Methodology A questionnaire was attached to the monthly magazine of the French-speaking Dental Society, reaching approximately 2400 active Walloon dentists. 48 multiple choice questions on clinical decision making are discussed in this study. The questionnaire could be returned free of charge. Data were imported in a database and subjected to descriptive and analytical statistics. **Results** The response rate was 25%. 58% of the respondents had 0 to 5 implants/month placed, but only 10% placed implants themselves. Moreover, a trend toward more implant treatment was obvious in the more recently graduated colleagues. Implants were often used for the replacement of one tooth (65%), several teeth (63%) or to support a denture in de mandible (59.5%). About 15% of the respondents used implants in combination bridges. The vast majority of the respondents avoided implant placement in patients under 18 years old. Furthermore, over half of the respondents would not place implants in smokers, diabetics or in the vicinity of the mandibular nerve. In patients suffering from osteoporosis or who underwent chemotherapy, the conservative treatment option was preferred (62.4% and 81.9% favouring RCT respectively). 63% acknowledged a treatment decision didn't always had to be evidence based. Almost 75% was convinced an endodontic treatment was the most predictable procedure and on average 30% of the respondents

believed implant survival was higher than endodontic survival. However, half of the participants disagreed with the statement that implants were confronted with up to five times more complications than RCT teeth with a crown and over 80% was convinced that implant treatment is a predictable procedure.

Conclusions This survey revealed that internationally accepted guidelines are not followed enough in daily practice; dentists are themselves a key factor in the patient's treatment choice; and more recently graduated dentists are more implant oriented.

GE155

Prevalence of apical periodontitis and frequency of root canal treatments in cigarette smokers *Cicmil S¹, Vukotic O¹, Krunic J², Stojanovic N²

Departments of ¹Oral Rehabilitation, ²Restorative Dentistry and Endodontics, University of East Sarajevo, Faculty of Medicine Foca, Foca, Bosnia & Herzegovina

Aim The aim of this study was to investigate the prevalence of apical periodontitis (AP) and endodontic treatment in smoker subjects and controls.

Methodology In a cross-sectional study, the radiographic and clinical records of 40 smoker subjects and 40 nonsmoker subjects were examined. Periapical status and frequency of root-filled teeth was recorder on the basis of examination of digital panoramic radiographs. Peripical status was scored using periapical index score (PAI). The presence of AP was defined as PAI score >2. The Student t test and chi-square test were used in the statistical analysis.

Results AP in one or more teeth was found in 70% smokers and in 55% of nonsmokers (p>0.05). The prevalence of one or more root-filled teeth, one or more root-filled teeth affected with AP and one or more untreated teeth affected with AP teeth was higher in smoker compared with nonsmoker subjects, although the differences did not reach statistical significance. Smoker subjects had significantly more root-filled teeth with AP (p<0.01), and untreated teeth with AP (p<0.05) than nonsmokers.

Conclusions The obtained data showed higher number of untreated teeth with AP and root-filled teeth with AP in smokers comparing to non smokers.

SATURDAY, SEPTEMBER 19th

Case report or case series

GE56

Perio-Endo Approach to a crestal perforation: 4 years Follow up *Marzari G *Private Practice, Bardolino Verona, Italy*

Aim This case report shows how crown lengthening surgery may eliminate all factors that poorly affect prognosis of crestal perforation's treatment.

Summary A healthy 28 yrs old female patient was diagnosed with a symptomatic cronic apical periodontitis on tooth 1.6 which was already endodontically treated and no periodontal probing beyond 3mm.

Treatment plan included: endodontic re-treatment, complete cuspal coverage with an indirect composite overly. During endodontic re-tareatment procedure a crestal perforation communicating with oral cavity was discovered and sealed with a MTA. As cervical perforation with oral cavity communication have really poor prognosis due to interference with periodontal health , a crown lengthening surgery was planed in order to eliminate all factors that affected the outcome of the treatment such position and material used to seal the perforation. During the surgical treatment an impression for a composite overlay was taken. 7 days after surgery, suture where removed. The same day after rubber dam was placed the composite overlay was cemented and the perforation was obturated with composite as a V class restoration. Clinical and radiographic follow ups at 6 months, 2 years and 4 years show success of the endodontic and restorative treatment as maintenance of periodontal health's positive prognostic factors.

Key Learning Points

- Complete periodontal diagnosis my help treating complex endodontic cases
- Knowing timing of periodontal wound healing a key factor for correctly plan the treatment
- Periodontal surgery eliminated all factors that poorly affected crestal perforation's

GE157

Surgical retreatment of gutta-percha overfilling (over 10 mm) at the attached periapical and external root resorption: clinical report.

Ozcan caliskan E¹, *Barut G², Uzuner Tas¹, Erisen R²

Department of Endodontics, ¹Istanbul Aydin University, Faculty of Dentistry, ²Istanbul University, Faculty of dentistry, Istanbul, Turkey

This article case report presents the periapical surgical retreatment of maxillary canine with extruded root canal filling into the periapical lesion.

Introduction When the initial root canal therapy is defined as failed, the reperforming therapy is following removal of the root filling is called retreatment. In the some cases in which the external root resorption apically (with periapical lesion), the tooth can be treated in association with endodontic retreatment and periapical surgery and retrofilling.

Case presentation: A 24-yr-old female, haven't got any general health problems was referred for the root canal treatment of the right maxillary canine, 2 years previously. The patient complained of painful swelling on the mucosa over the right upper canine teeth and the tooth was hypersensitive to percussion and. There was a large composite filling on the lingual surface. Radiographic examination revealed that the right upper canine has a large radiolucent lesion and external root resorption. The root canal treatment was insufficient to remediate the condition, and there were extruded gutta-percha points (over 10 mm) in the lesion. At first, extruted gutta-percha points were removed through root canal. Retreatment procedure was performed with ProTaper retreatment

files (Dentsply, Mail lefer,Ballaigues, Switzerland) with a sequence ofDI(30/0.09),D2(25/0.08) and D3(20/0.07) files respectively. The canals were irrigated with 1% NaOC1 .After completion of preparation, the smear layer was removed with 5mL of 17%EDTA and 5mL of 1%NaOC1 as the final rinses,dried with paper points. The root canals were obturated with gutta-percha cones covered with AH-Plus sealer (Dentsply,De Trey,Konstanz,Germany) using the cold lateral compaction technique. After root canal treatment, at the same session, mucoperiosteal flap was reflected, the granulomatous tissue was curetted carefully. A deep and wide root-end cavity was prepared, filled with mineral trioxide aggregate (MTA-Pro Root,Dentsply,Tulsa Dental Company).

Discussion After the treatment at 6 months,1 and 2 years, the tooth exhibited no clinical symptoms, the radiograph performed during the 2-year follow-up showed a complete periapical healing around the root end.

Conclusion The present report indicates that MTA retrofibling can be used successfully in the surgical retreatment of cases in which the external root resorption apically.

Pic.3

Pic.4

Endodontic customized fiberglass posts: a new proposal

Dr. Angelo Sonaglia, Prof. Giancarlo Barraco, Dr. Alessio Tariciotti, Prof. Stefano Eramo Perugia University

Aim Creating an individualized endodontic post, resulting from real endodontic anatomy, extremely precise, resistant, flexible and monolithic.

Introduction The metal posts are monolithic, extremely precise and resistant but at the same time are too hard when compared with the resistance of the tooth, does not have adhesive characteristics and are not aesthetic. The glass fiber pins of the companies, are cosmetic, adhesive, flexible and resistant, but are not precise in all the roots (Pic.1) leaving a lot of cement between the post and canal walls which favors greater polymerization shrinkage and are not monolithic, in fact, after their cementation require the reconstruction of the abutment (Pic.2) which can introduce other potential errors such as contraction or detachment.

With this new systematic it is possible to combine the advantages of the fused pins to the advantages of the glass fiber pins . First step is scansion of the root canal with the intraoral scanner (Pic.3), then send the information to the milling machine and from a block of glass fibers (Pic.4) it's possible to obtain a monolithic post-core (Pic.5), tailored to the patient and very precise. If you don't have a scanner, you can do the same taking an impression with silicone or

poliether and send it to a laboratory wich have a scanner for models and a milling machine. Taking the imprint of the antagonist is able to get a pin with the walls already preparated and with the spaces already calculated in the laboratory(Pic5).

Case presentation A.G. 38 years old it needs a restoration of the 1.5. The canal is oval and the pin standard does not fit properly. Instead, the scanned pin, is extremely accurate and after cementation

can be milled to offer retention to the prosthetic crown (Pic.6)

Discussion with this construction technique is the pin that fits to the channel and not the other

Conclusion and clinical rilevance With this systematic you will have several benefits including: greater respect for the anatomy, less cement between the pin and the channel with lower risks of incorporating bubbles and lower polymerization shrinkage. The piece is monolithic and therefore more resistant, without the risk of detachment of the pin from the core and with the

same elasticity. The glass fibers make the post with a hardness and a flexibility next to dentin. The laboratory may postpone the pin with the walls already prepared, with a fair degree of parallelism and with the thicknesses adjusted so that the dentist only needs to cement the pin without milling in the mouth. If a patient has more pins to do on neighboring teeth, it can be made simultaneously and perfectly parallel (Pic.7).

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	223	62





Pic.1

Pic.2

Pic.6



Endodontic Treatment With MTA Apical Plug: Three Case Reports *Çelikkol B, Kandemir Demirci G Department of Endodontology, Ege University School of Dentistry, İzmir, Turkey



 Mineral Trioxide aggregate (MTA) is an efficient material, forming an effective seal against apical microleakage for open apex teeth.

·MTA barrier contributes to the periapical healing.

 Considering basic characteristics and long term success rate of mineral trioxide aggregate, it is recommended to use it in more open apex cases.

Using CBCT to evaluate trismus in patient caused by sodium hypochlorite accident : Case Report *Kuo CY, Chen KL, Fan XY, Chen YMH

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Using cone-beam computed tomography (CBCT) to evaluate trismus in

patient caused by sodium hypochlorite accident : Case Report

Aim: Using cone-beam computed tomography (CBCT) to identify the location and extent of tissue destruction caused by Sodium hypochlorite (NaOCl) accident.

Instruction: Potential complications can occur if NaOCl extruded into the periapical tissue and are usually associated with pain, swelling and tissue damage, described as a NaOCl accident.

CBCT have been described mostly for preoperative assessment and treatment planning. Current literature has demonstrated the benefits of CBCT in diagnosis and treatment in endodontic procedures.

Case presentation: This case is a 39-year-old female who was referred for endodontic retreatment of the maxillary first premolar (Fig.1).



Figure. 1



Figure. 2

During root canal treatment, NaOCl was accidentally extruded into the periapical tissue which led to immediate facial swelling and trismus (Fig.2). Intramuscular injection of steroid was given right after the incident and prophylactic antibiotics, steroid, analgesics medication was prescribed.

Presence of trismus is suggestive of masticator space involvement, so CBCT was taken for damage assessment and it showed tissue destruction > emphythema in adjacent soft tissue and invasion of the masticator space (Fig.3). The patient was recalled on a daily basis to monitor symptoms during recovery. No complications were noted at subsequent root canal and prosthesis treatment.



Figure. 3

Discussion: CBCT provides detailed high-resolution images of oral structures and enables the recognition of tissue damage when NaOCl accident occurs.

Conclusion and clinical relevance: The present study showed that CBCT can be an effective diagnostic device to identify the extent of soft tissue injury caused by NaOCl accident, of which early recognition and treatment can ensure full recovery and best clinical practice.

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Persistent apical periodontitis associated to poor controlled type 1 diabetes mellitus *Barrientos-Delgado JF, Yanes-Barroso E, Ibáñez-Barranco R, Ávila-Castellano A, Segura-Egea JJ Patología y Terapéutica Dental, Universidad de Sevilla, Sevilla, Spain

INTRODUCTION: Diabetes mellitus causes impaired immunologic and inflammatory responses. Epidemiologic studies have demonstrated that root-canal treatment failure, with persistent apical periodontitis, is more frequent in diabetic patients, particularly in poor controlled diabetics. A case of persistent apical periodontitis of the right upper lateral incisor in a poor controlled type 1 diabetic patient is reported.

CASE PRESENTATION: A female patient with uncontrolled diabetes mellitus type I (HbA1c = 9%) seeks for dental assistance because debonding of a metal-ceramic crown of the right upper lateral incisor. The tooth had been endodontically treated. Periapical radiograph revealed a radiolucent periapical lesion around the root apex of the tooth. A swollen area was evident in the palate. Despite the poor conditions and risks, decision was made to keep the tooth carrying out non-surgical re-treatment and restoring the tooth with a fiber post and aluminous porcelain crown. A slight crown lengthening was needed to obtain ferrule. After re-treatment, patient showed palatal swelling and pain during two days. A month after re-treatment pain and palatal swelling were disappeared.



DISCUSION: Root canal therapy in patients with systemic diseases such as type I diabetes is a major challenge for the clinician. We need to know the limitations of these diseases and inform the patients before starting the treatment.

KEY LEARNING POINTS AND CLINICAL RELEVANCE:

1- Apical periodontitis is more prevalent in diabetic patients.

- 2-Dentist must keep in mind that uncontrolled diabetes, and other systemic diseases, can alter periapical healing.
- 3-Periapical healing processes in diabetic patients can become slower and hence lead to complications.

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DISCUSSION

The use of the CBCT before performing root canal retreatment must always be justified. Nevertheless, root canal retreatment molar is always a challenge for the specialist due to their complex internal anatomy, so the use of CBCT is turning to be a fundamental tool to achieve success on our treatments.



CONCLUSIONS AND CLINICAL RELEVANCE

- 1- Ludwig's Angina, a deep neck infection, is a rare but potentially fatal complication of pulpal abscess of the teeth. Its treatment requires antibiotics early treatment.
- 2- It is critical that dentists be able to recognize the danger signs and identify the patients who are at risk of Ludwig's Angina
- 3- CBCT is useful detecting missing root-canals.
- 4- Dental operatory microscope is useful in non-surgical root-canal retreatment.

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AIM

The aim of direct pulp capping and pulpotomy is to potentiate the regenerative capacity of the affected pulp, allowing reparative dentin formation and continued root maturation.

INTRODUCTION

Some authors have suggested the favourable biological properties of tricalcium silicate cements (Biodentine) make them valuable for preserving the vitality of the pulp in permanent teeth with irreversible pulpitis

CASE PRESENTATION

This case report describes a deep carious lesion affecting the pulp of a permanent tooth in a 13year-old patient who referred spontaneous pain and diagnosed as irreversible pulpitis with clinical and radiographic controls up to 8 months after the pulpotomy using Biodentine





INITIAL









CARIES AND EXPOSURE



BIODENTINE

FINAL RESTORATION

8 MONTHS FOLLOW UP

CONCLUSION

Conservative treatment strategies for direct pulp capping and pulpotomy show promising potentials for improved outcomes in immature teeth with extensive caries, traumatic pulp exposures, or anatomical anomalies. Preservation and protection of the dental pulp in developing teeth promote root

maturation and extend tooth survivability by postponing or even preventing more complex endodontic and restorative care.

Recall radiographs and controls are important to evaluate reparative bridge formation, root maturation, pulp calcification and signs of periapical pathosis

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The prognosis of endodontic retreatment : an 1-yr follow-up *Kim RA, Kim JH, Song BC, Nam W Department of Conservative dentistry, Seoul Veterans Health Service Dental Hospital, Seoul, Republic of Korea

• Aim : To review the outcome of non-sugical endodontically retreatment and discuss the optimal treatment of posttreatment disease.

• **Introduction** : In a recent systematic review was reported that in the absence of prior apical periodontitis, the incidence of healed cases after both initial treatment and orthograde retreatment ranges from 92% to 98% up to 10 years after treatment. When prior apical periodontitis is present, the incidence of healing drops to 74% to 86%, regardless of whether initial treatment or orthograde retreatment was performed.(1)

• **Case presentation** : A 70-year-old male patient was referred for biting discomfort on the mandibular right first molar(#46). Endodontic treatment had been performed on the tooth 18 years before. On clinical examination, the tooth(#46) was sensitive to percussion . The periodontal probing depth of #46 was within normal limit. Radiographic view(fig1-1) and CBCT view(fig2-1) revealed periapical lesion around the apex of mesial and distal root. The diangosis was apical periodontitis. After the previous gold crown and amalgam was removed, and the gutta-percha were removed with solvent and Gates-Glidden drills. A sufficient canal irrigation was performed using NaOCI. After 1 month, the patient was asymptomatic and the root canals were obturated with gutta-percha and AH plus(*Courtesy DENTSPLY, Konstanz, Germany*) using continuous wave of condensation(fig 1-2). A follow-up examination was performed at 1 year, and clinical examination revealed normal probing, mobility and function without symptoms. The periapical radiograph(fig1-3) and CBCT view(fig2-2) showed the radiolucency is considerably reduced.



Fig2-1 preoperative CBCT view

Fig2-2 One-year follow-up (CBCT view)

• **Discussion** : In this case, the radiolucency is considerably reduced and the tooth is asymptomatic function. Thus, the prognosis of nonsurgical endodontically retreated tooth, in terms of healing and functionality, is very good even though the tooth has apical periodontitis. The chance of complete healing is reasonably high , and the chance for the tooth remaining asymptomatic and functional over time is truly excellent. This clear, even if not optimal benefit should be routinely communicated to patients when endodontic therapy is weighed against tooth extraction and replacement with a prosthetic device. (2)

• **Conclusion** : Non-surgical endodontic retreatment has a favorable prognosis, thus it can be the first treatment option against tooth extraction and replacement.

Reference

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Outcome of regenerative endodontic treatment of immature teeth with pulp necrosis: A case series Mindere-Gubele A¹, *Lina Legzdina L²

RSU Institute of Stomatology, Riga, Latvia





To report outcome of four year follow-up of five cases with immature teeth-where a regenerative treatment protocol was used.

Case presentation

Five immature maxillary anterior teeth with pulpal necrosis (in five patients) were treated. All teeth had necrotic pulp caused by trauma where three of them were luxated and two were avulsed. Three cases where diagnosed as chronic apical abscess with sinus tract, two as acute apical abscess. Radiographic examination showed periapical radiolucency in four cases. For regenerative treatment NaOCl 5, 25%, a triple antibiotic paste (ciprofloxacin, metronidazole, and minocycline) mixed ex tempore where used in first appointment. Access was temporarily restored with IRM (Dentsply).

At the time of second visit all teeth where asymptomatic. Sinus tracts were no longer present. Canals were flushed with NaOCl 5, 25%. After blood clot in the root canal was achieved a coronal seal of ProRoot *MTA (Dentsply) and composite was applied.

After four years of follow-up all five teeth were functional and symptom free. Four shoved resolution of periapical radiolucency, whereas two of five teeth continued root development. Ankylosis was observed it two avulsed teeth.

Conclusions

Pulp regeneration was not achieved, but functionality was restored. The outcome can be related to type of trauma and treatments used.









Dens invaginatus management: diagnostic and therapeutic implications * Dambra V, Pasqualini D, Berutti E

Endodontics, Dental-school university of turin. italy, turin, Italy AIM

Describe diagnostic and therapeutic implications in the management of Dens Invaginatus.

In this case report are shown two cases of dens invaginatus, endodontics retreatment compared with a paradigmatic case of initial treatment (case1).

CASE1 female patient, 18 years. Dens Invaginatus 1.2, two different endodontics sistems. Pulp necrosis, apical chronic periodontitis; intraoral RX and CBCT.

TREATMENT PLAN: Endodontics treatment (5)

Indication for conventional endodontic treatment 1.2 for both canal (independent between them).

Use of the surgical microscope. In line with the literature, according to the study of Bishop K, Alani A.at International Endodontic Journal 41,1137-115, 2008 in cases where the pulp is necrotic, we have an indication for treatment of the invagination and root canal separately.

CASE2 male patient, 16 years. Dens Invaginatus retreatment 1.2; the invagination communicates with the main canal, absence of an independent outlet. Apical, chronic and exacerbation periodontitis. Intraoral RX.

TREATMENT PLAN: Orthograde retreatment through MTA apical plug technique (5).

Orthograde retreatment of 1.2. Given the presence of infiammatory exudate at periapical level, we have the indication to use the MTA apical plug; the positioning of the MTA occurred by orthograde with the aid of the surgery microscope. Closing the root canal with conventional techniques to 7 days. In cases where the anatomy of the root apex is not suitable for conventional closing with gutta-percha, the MTA material is the best choice in the apical invagination area. (Bishop k., Alani A. Dens invaginatus; International Endodontic Journal, 41, 1137-115, 2008).

CASE3 female patient, 25 years. Dens Invaginatus 2.2 treated twice by orthograde and once retrograde. Persistent disease. The invagination communicates with the main canal. Apical, chronic and exacerbation periodontitis. Intraoral RX.

TREATMENT PLAN: Orthograde retreatment through MTA apical plug technique (5).

Orthograde retreatment through MTA apical plug technique of 2.2.

The presence of a communication between the invagination and the root canal directs the treatment plan to the breakdown of invagination and retrograde filling material until the access to the main root canal through ultrasonic tips (StartX). The positioning of MTA occurred by orthograde with the aid of the surgical microscope. Closure of the root canal with conventional techniques to7 days. (*Bishop k., Alani A.Dens invaginatus; International Endodontic Journal*, 41, 1137-115, 2008).

MATERIALS AND METHODS

Case1: opening of the pulp cavity with ultrasonic microscopy, survey of the two different channel, K file 10. Glide-Path with pathfile. Shaping with Protaper: S1, S2, F1. Irrigation: NaClO to 5%, EDTA to 10%. Root filling coronoapical through "down pack" and "back packing" through Obtura. Composite filling as coronal seal.

Case2: opening of the pulp cavity and removal of the single cone in the canal with the aid of microscope and ultrasound. Placement of MTA Apical Plug in the 3rd apical. 7 days after: filling and back packing with Obtura. Composite filling as coronal seal.

Case3: opening of the pulp cavity, removal of the filling material from retrograde filling with ultrasound (StartX) at the surgery microscope. Placement of MTA in the 3rd apical. 7 days after: back packing with Obtura. Composite filling as coronal seal.

RESULTS

Remission of symptomatology 15 days after treatment. Clinical and radiological controls to evaluate regression of periapical lesion.

CONCLUSION

Dens Invaginatus is a developmental abnormality result of a deeping or invagination of the enamel organ into the dental papilla in an early stage of the growth.

The lack of recognition of the complex anatomy of the Dens Invaginatus may produce an inadeguate endodontic treatment and an unsuccessful.

The correct interpretation of the anatomy allows the selection of orthograde endodonics technique indicated. In case of great or reabsorbed apices, the MTA apical plug is the first choice.

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A rare case of multiple taurodontism and endodontic management of a maxillary first molar with mesotaurodontism and four root canals

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Aim: To describe a rare case of multiple taurodontism affecting all molars in a 16 year-old male and endodontic treatment of a maxillary right first molar with mesotaurodontism and 4 root canals.

Summary: Taurodontism is a developmental anomaly which is potentially caused by the failure of Hertwig's Epithelial sheath diaphragm to invaginate at the proper horizontal level and is characterized by a vertically elongated pulp chamber, apical displacement of the pulp floor along with a bifurcation or trifurcation, and a lack of constriction at the level of the cementoenamel junction. This case report describes a rare case of multiple taurodontism which affects all molars and endodontic management of the right maxillary first molar with mesotaurodontism. A 16-year-old male patient was referred to the Department of Endodontics, Eskisehir Osmangazi University, Turkey for endodontic treatment of the maxillary right first molar with pain when biting for the previous three or four weeks. During a clinical examination, a composite filling with loss of adaptation and secondary caries was observed. The tooth had a delayed response to a vitality test. No tenderness from palpation and percussion was observed. After a clinical examination, an intraoral periapical radiograph was examined. A large pulp chamber was detected, related to mesotaurodontism for either the first or second molar (Fig. 1). A panoramic radiograph was taken to examine the existence and degree of taurodontism for all teeth (Fig. 2). The degree of taurodontism was classified according to Shifman and Channel (1978). The tooth was anaesthetized and isolated with a rubber dam. After removing the composite filling and secondary caries, an endodontic access cavity was prepared. The pulp was extirpated and four canals mesiobuccal, distobuccal, mesiopalatinal and distopalatinal - were located. The working length was determined with an electronic apex locater. Hand instrumentation was performed for preparation of the root canals. During preparation, the root canals were irrigated with 2.5% NaOCI. The root canals were obturated with the cold lateral compaction and vertical compaction technique (Fig. 3). The tooth was restored with composite resin.





Key learning points:

- Although taurodontism is a rare dental anomaly, it needs special attention during endodontic treatment.
- In addition to the difficulty of endodontic management, taurontic teeth could have an abnormal root canal system such as extra root canals.

Idiopathic Root Resorption Treatment: Case report

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Case Presentation:

A 9- years old girl was referred to the Endodontic Posgraduate Clinical for endodontic evaluation of both central incisors. After clinical and radiographic examinations the teeth were diagnosed with the normal pulp condition. However, radiographically it was discovered, that there was a diminution in the root length of central incisors because a resorptive process (fig.1). Treatment plan include revascularization protocol with the objective of induce root length growth¹. However, bleeding was not achieved in tooth 9, because of that, it was decided to place MTA as an apical barrier (Fig.2). CBCT examination confirmed the presence of a complete apical barrier and a long root length, free of symptoms and mobility was normal (Fig. 3). Tooth 8 was with the same root length and no apical barrier was seen, at this point, it was decided to place MTA (Fig. 4).



Discussion:

MTA as an apical barrier induced a better root development and deposition of mineralized tissue than revascularization treatment. Idiopathic root resorption can be treated using this protocol in order to keep in the mouth the teeth.²³

Conclusions and clinical relevance:

Early detection and an accurate treatment plan are essential, because of the progressive course of this condition that can lead to an early loss of teeth. CBCT examination is a useful tool in order to evaluate the evolution in these cases.



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Apical periodontitis case report *Damian Morales R, Jácome Musule JL, Chávez Bolado E Endodontics Posgraduate, National University of Mexico UNAM, Mexico City, Mexico

Aim: The purpose of this study was to evaluate the effectiveness of non surgical endodontic therapy of chronic apical periodontitis.

Introduction: The Apical periodontitis is a chronic inflammatory disorder of perirradicular tissues caused by aetiological agents of endodontic origin they often occur without any episode of acute pain and are discovered on routine radiographic examination. Surgery should only be considered if persist signs or symptoms after nonsurgical endodontic therapy, or if there is no evidence of healing during extended follow-up periods.

Case report: 51 years old male patient with no systemic diseases, mentioned that wants his teeth bleach. he has Suffered a blow 20 years ago of tooth 11, at evaluation it does not has periodontal pockets but has mobility so endodontic treatment was made; one month after the root canal treatment, tooth valuation which still has mobility and persistent radiolucent area was conducted, so that surgical treatment is evaluated.



Endodontic treament of afused maxillary central incisor: Long term follow up with CBCT Cimilli Z, *Kartal N Department Restorative Dentistry, Marmara University, Istanbul, Turkey

A case report of endodontic treatment of maxillary central incisor that fused with a supernumerary tooth is presented. In this case, to gain an adequate space for the maxillary incisors in the dental arch, the fused tooth was prepared for endodontic therapy. Cleaning and shaping of the root canals were performed. Biomechanical preparations were completed with the step-back technique, and irrigating with copious amounts of 5.25% sodium hypochlorite solution. Calcium hydroxide powder (Merck, Darmstadt, Germany) was mixed with lidocaine solution and introduced into root canal system. At the second visit, the root canal system of the fused maxillary central incisor was obturated with Thermafil obturators by using lateral condensation technique. After 11 years (at the last recall visit), the tooth were asymptomatic, with all findings being within normal limits. The clinician must determine the unusual anatomic configurations and malformations. CBCT is the most useful tool for diagnosis and follow up the cases.

GE171

An unusual management of complicated crown-root fracture: one year follow up of two cases *Akpek F, Aslan T, Sagsen B, Ustun Y

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Aim The aim of this case report is to present the two patients' traumatic injury of permanent maxillary left incisor and their one year follow up results.

Summary: In the first case, a 22 years old male patient applied to our clinic one day after the trauma. Clinical and radiographic examinations revealed a complicated crown-root fracture at upper left central incisor tooth. Fracture line was located deeply under the gingival margin at palatal surface of 21. After removal of coronal fragment under local anesthesia, tooth was extracted gently, rotated ¹⁸⁰⁰ around its long axis, and re-implanted to the socket as the fracture line level became over the gingival margin at buccal side. Semi-flexible splint was performed from maxillary right central to maxillary left lateral for two weeks. At the same appointment, root canal treatment was begun. Calcium hydroxide paste was placed as an inter-appointment medicament. In the next appointment, root canal treatment was finished and splint was removed. Patient was referred to a prosthodontist for coronal restoration. In the second case, a 21 years old male patient referred to our clinic one day after the trauma. Clinical and radiographic examinations revealed a complicated crown-root fracture at upper left central incisor. Fracture line was located deeply under the gingival margin at palatal surface. Same treatment procedures were followed as in the first case. At the end of one year follow up period, there were no related symptoms in both cases.

Key Learning Points:

- In cases where fracture lines extend coronal to under gingival margins, exposure of fractured margins becomes necessary.
- In the present cases, teeth were extracted, turned and re-implanted to make fracture lines visible for easier coronal restoration.
- Long term follow up is required in order to evaluate the treatment success.

GE172

Healing of a hopeless case *Yalçın Y, Dindar S, Yılmaz B Department of Endodontics, İstanbul University Dentistry Faculty, İstanbul, Turkey **Aim** After implant technology have entered in our clinics, patients and dentists face a paradox about hopeless cases. But sometimes this paradox can be more confusing from others. At this point, this case report provides data to us of how periapical lesions can be treated solely with root canal thearapy.

Methodology A 45 years old male patient referred to the Department of Endodontics, Dental Faculty, İstanbul University with a history of pain located on the left maxillary region. After clinical and radigraphical examination, multiple periapical lesions were detected and six root canal therapies were done.

Results Six-month and 1-year follow-ups indicated satisfactory healing of the periapical lesions. But if we had extracted the left molar tooth, we also had to do a sinus-lifting operation prior to the implant surgery. And these time-consuming extensive operations would have led to further financial difficulties.

Conclusions The outcome of this case emphasizes the importance of a successful endodontic treatment and that tooth extraction should be the last choice.

Multidiciplinary management of the unilateral fusion in a maxillar insisor in association with a supernumerous tooth: A report of a rare case

*Guven N, Topuz O

Department of Endodontics, Gazi University, Ankara, Turkey

AIM

The purpose of this case report was to present the multidisciplinary treatment of a patient who had a macrodont permanent maxillary right santral incisor fused with a supernumerary tooth

SUMMARY

A 19 year old male patient without systemic disease was referred to our dental clinic requesting alignment of his asimetric, unaesthetic teeth. His chief complaint was of the right maxillar santral tooth without clinic symptoms but was too big. Intraoral examination revealed that permanent maxillary right central incisor was fused with a supernumerary tooth. . In the radiographic evaluation, it was determined that the fused tooth had a single root (figure1). The patient had been evaluated by both a endodontist and prostodontist. Because of the space deficiency, the maxillary right lateral incisor was extracted. Endodontic treatment of the fused maxillary right central incisor was planned to provide aesthetic appearance and to gain space for porcelain crown. Written informed consent was obtained. After providing local anesthesia and rubber dam isolation, the pulp canal was instrumented using the crown-down technique and obturated with cold lateral condensation technique in one-visit (figure b). Final restoration was completed with a light cured composite resin cement. Following endodontic procedures, prosthetic restoration completed by the prostodontist. At 6 month post endodontic follow up, the patient was not afflicted with any clinic symptoms like pain, sensivity to perkussion or palpasion. . The radyographic evaluation showed that there were no signs of resorbtion and enflamation.



Clinicians should be aware of possible anatomic variations and that thorough diagnosis by using appropriate technologyis crucial to determine the treatment option that will provide the best outcome.

. Consultation with specialists in different areas is advised because a multidisciplinary approach may be required, depending on the complexity of the case

@ Reshaping the fused tooth with crown is one the most common treatment alternatives

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Influence of using surgical guides in apical microsurgery *Aguilar AA, Abella FA, Duran Sindreu FD, Roig MR Endodontics, Universitat Internacional de Catalunya, Barcelona, Spain



Influence of using surgical guides



in apical microsurgery

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AIM:

To present the influence of using surgical guides in apical microsurgery cases that do not present buccal fenestration or dehiscence.

INTRODUCTION:

Apical microsurgery is a surgical procedure performed to treat apical periodontitis, using surgical guides has been suggested to perform this type of surgeries

CASE PRESENTATION:





Patient was referred to the Endodontic Department of the Universidad Internacional de Catalunya to undergo apical surgery, presenting chronic apical periodontitis and difficulty to perform orthograde retreatment. The surgical approach was performed using a surgical guide.

First, a scannographic guide was initially fabricated using acrylic material. It extended into the buccal vestibules apical to the future surgical locations. The maxilla, was then scanned using CBCT. Files were imported into an implant planning software. The osteotomy was planned to end at the apex







DISCUSSION:

Results found in this case are consistent with other using CAD/CAM guides. The apex was more precisely and consistently localized utilizing computer guidance

CONCLUSIONS AND CLINICAL RELEVANCE:

The use of surgical guides provides more accuracy to the clinician at the time of performing the surgical procedure and it also reduces the intraoperative time

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Maxillary First Molar with five root canals: Tooth #16

INTRODUCTION: In this root canal treatment, thank to the aid of magnification, it was possible to diagnose the location of the 5 root canals in the maxillary first molar, for which we used the Optomic Fibrolux 150 Dental microscope.

OBJECTIVE: Confirm the location of all the root canals via microscope, resulting in a better prognosis of the treatment.

CLINICAL CASE: patient 27 years old male with no relevant medical history, comes to Mississippi Dental Institution as an emergency complaining of sensitivity to cold and pain when chewing in the rear upper right area. Exploration: Tooth 16 with cracked amalgam filling. Tests: negative to percussion, negative to probing and positive response to cold testing. Diagnosis: symptomatic irreversible pulpitis of tooth 16.

Four root canals were located with visual exploration (MB, DB, 2 P) and with the aid of the microscope we were able to locate the MP canal. According to Cleghorn et al. 2006, the mesial root has two canals in 56.8% of cases, the distal root has one canal in 98.3% of cases, and the palatial root has only one root in 99% of cases.



1) RADIOGRAPHIC DIAGNOSIS: Three roots can be observed in tooth 16 with no lesions of any type. The crack in the amalgam can be seen.



2) OPENING: As a result of the magnification, it is possible to see the opening and layout of the canals.





3) CONDUCTOMETRY:The working length is located using the Morita DentaPort ZX apex locator.

The working lengths are: MB: 18mm, MP: 17mm, DB: 21mm, P1: 21mm, P2: 21mm. The canals were instrumentated with Protaper next (DENTPLY, MAILLEFER) files up to size X2 for the mesial and distal canals, and X3 for the palatal. Then K files up to #30 apical diameter for the mesial and distal up to #35 for the palatal canal. Canals were irrigated with 5.25% sodium hypochlorite.





4) OBTURATION: Obturation performed using the lateral condensation technique and AhPlus sealer.

5) RESTORATION: After the root canal therapy, the tooth was prepared in order to fit an Endocrown. It was cemented using 3M Relyx.

6) CONCLUSION: The aim of this work is the importance of the magnification in the root canal treatment procedure. Failure in endodontics. Sometimes is because we don't find all the canals, so thats why must use magnification.

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Autotransplantion of an immature third molar a successful treatment option *Nuñez AL1, ABELLA F2, DURAN-SINDREU F3 Department of Endodontics and Restorative, University International of Catalunya, BARCELONA, Spain

Aim This case report describes autotranspiantion of third molar with incomplety formed roots as a viable treatment option when permanent first molar needs to be extracted. **Summary** The permanent first molar is the most caries prone permanent tooth, probably because of its early exposure to the oral enviroment. Unrestorable teeth need to be extracted. Its extraction leads to unfavorable oclusal changes. Fixed prothesis and implants are not feasible in growing patients because they may impede the normal growth of facial bones, in particular, of the alveolar process. This cases report describes the autotransplantion of a third molar with developing roots in a young female patient, folowing transplantation into the socket of mandibular first molar, the tooth was stabilized with sutures. On recall examination 2 years and 6 month after completion of the surgical procedure, the transplant responded positively to electric pulp testing, sensitive testing and show absence of infection, ankylosis or progressive resorption. The transplantation pf a third molar can be seen as a promising method to replace a lost permanent tooth.

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Are the treatment planning principles changed? Dindar S, *Yalçın Y Department of Endodontics, İstanbul University Dentistry Faculty, İstanbul, Turkey

Aim After implant technology have entered in our clinics, treatment planning principles changed and some confusions occured. In addition to this confusions, implant therapy is thought more long-lived so many teeth have extracted. We will discuss 5 complex cases and treatment planning principles to look from both sides.

Summary Endodontic treatment has respectable success rates if we can properly sellect cases but after implant therapy came to our clinics some teeth extracted for to make implants. And we have started to discuss implant success rates. We will try to remind extraction is last choice and root canal treatment is generally first choice with proper selected cases.

ENDODONTIC RETREATMENT AS A CONSERVATORY SOLUTION IN THE THERAPY OF IATROGENIC APICAL LESIONS CASE REPORT Gheorghita LM¹, Diaconu OA¹, Moraru IA², Petcu C¹, Tuculina M², Moldoveanu GF³ ¹ – Department of Endodontics, University of Medicine and Pharmacy, Craiova ² – Department of Odontology, University of Medicine and Pharmacy, Craiova ³ - Department of Endodontics, University of Medicine and Pharmacy, Bucharest

Abstract. Aim. The present work aims to provide a radiological analysis of the advantages presented by the non-surgical retreatment of iatrogenic lesions using rotary instruments. Lack of homogeneity and incomplete root canal filling generate chronical apical lesions with radiolucency or osteocondensation.

Methodology: The patients presented adressed Endodontic Clinic of the Faculty of Dentistry, University of Medicine and Pharmacy Craiova with chronical apical lesions radiologically observed, caused by incorrect endodontic previous treatments. The decision is taken to choose endodontic retreatment abiding very strictly by the protocol therapy (isolation using rubber-dam, regaining the coronary access, correcting the access cavity and identifying the root canals, shaping and cleaning the root canals, removing the rest of sealer and gutta-percha, chemo-mechanical preparation of the root canal, irrigation with antiseptic solutions (sodium hypochlorite 3%, EDTA17%, chlorhexidine 0,2%, citric acid 10%) with ultrasonic activation all along the working area, intracanalar medication using calcium hydroxide paste. The patients are followed-up for a period of time from six months up to two years.

Clinical case no.1. A 35 year old female patient presented in Endodontic Department accusing masticatory disfunction in both first lower molars, with previous exacerbation of pain which decreased after self-medication. After *the objective clinical examination*, the following were noticed: 3.6. - the existence of an unfit composite restauration with secondary decay; sensitivity revealed by palpation in the inferior buccal area at the level of 3.6; positive axial percussion at the level of 3.6; 4.6. - the existence of an unfit composite restauration with secondary decay; sensitivity revealed by palpation in the inferior buccal area; positive axial percussion at the level of 3.6; 4.6. - the existence of an unfit composite restauration with secondary decay in the distal area; positive axial percussion at the level of 4.6. Negative vitality tests in both 3.6 and 4.6. *The radiological examination* revealed the following: 3.6: incomplete and nonhomogeneous root canal filling; as well as the existence of a screwed post in the distal root canal; 4.6: incomplete and nonhomogeneous root canal filling; radiolucency in both periapical areas in 3.6 and 4.6. The chosen therapy was endodontic retreatment in both 3.6 and 4.6, after the removal of the post in 3.6, using rotary instruments and the irrigation solutions described above. In order to evaluate the results of the retreatment, the patient is asked to come for follow-up after six months, one years and two years.





Fig. 1 Pre-operatory radiograph

Fig. 2, 3 Post-operatory radiograph

Clinical case no. 2. A 38 year old female patient presented in Endodontic Department accusing masticatory disfunction in the 3.6 area, with previous exacerbation of pain and swelling which decreased after self-medication. After *the objective clinical examination*, the following were noticed: 3.6. - the existence of an unfit composite restauration with secondary decay; sensitivity revealed by palpation in the inferior buccal area at the level of 3.6; positive axial percussion at the level of 3.6. Negative vitality tests in both 3.6 and 4.6. *The radiological examination* revealed the following: 3.6; 4.6: incomplete and nonhomogeneous root canal filling; radiolucency in periapical area of 3.6 and osteocondensation in the periapical area of 4.6. The chosen therapy was endodontic retreatment in both 3.6 and 4.6, using rotary instruments and the irrigation solutions described above. In order to evaluate the results of the retreatment, the patient is asked to come for follow-up after six months, one year and two years.





LYMPHOMA: A CASE REPORT

*Rodríguez Bravo MA¹, Jácome Musule JL¹, Camacho Aparicio L¹, Contreras Valenzuela IA² ¹Department of Endodontics, ²Department of Periodontology, Faculty of Dentistry, National University of México (UNAM). México City, Mexico

Aim To present the importance of follow-up, multidisciplinary clinical management and early diagnosis of patients with cancer.

Introduction According to the World Health Organization many types of cancer can be cured if detected especially at an early stage. It's important that endodontists as part of the team of primary health care participate in multidisciplinary treatment plan with the aim of improving patient's quality of life.

CASE REPORT

A 50 year old female with a family history of cancer, she had deficient previously treated root canal treatments and apical radiolucent area related to teeth 22 and 12 an extrusion of endodontic filling material at tooth 11, the periapical diagnosis was asymptomatic apical periodontitis. Nonsurgical retreatment was made on the three teeth and was sent to prosthetics department for rehabilitation (a).



A year later, the patient returns to a follow-up appointment being found non-resolution radiolucent lesions and presence of sinus tract in teeth 22 and 12 and overfilling at 11 (b).

Periapical surgery was performed in teeth 11, 12 and 22. Six months follow-up were performed showing a clinical and radiographic satisfactory evolution (c).



с **Conclusions and Clinical Relevance :** Six months later, the patient had increased volume in lymph nodes, so she was sent to National Cancer Institute where she was diagnosed with diffuse large cell non hodkings lymphoma. She was treated with chemotherapy for 6 months having satisfactory response to this treatment and passing to follow-up stage.



Endodontics treatments require clinical and radiographic follow-up to evaluate its evolution.

Multidisciplinary attention is very important because the success of endodontic treatment is directly related to the final restoration and integration of the tooth to masticatory function

This case shows the importance of patient's exploration by the health care professionals to early diagnosis of some diseases like cancer.

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Direct pulp capping with MTA in a primary tooth: a case report *Coelho AI, Durán-Sindreu Terol FS Department of Endodontology, Faculty of Dental Medicine of the International University of Catalunya, Campus de Sant Cugat, Barcelona, Spain, Spain

Aim Preservation of pulp vitality in a primary tooth after pulp exposure during caries removal. **Introduction** Direct pulp capping is a clinical procedure that can help preserving the pulp vitality after pulp exposure due to dental trauma or accidental exposure during caries removal. Different materials have been used for this procedure but the best results have been obtained when MTA was used as direct pulp capping material.

Case presentation An 8 year old girl, with a non-contributory medical history, presented with clinically deep caries on tooth 85 and agenesis of 45. The patient denied a previous history of pain to external stimuli or spontaneous pain. The tooth 85 responded within a normal range to cold and percussion tests. The clinical pulpal diagnosis was reversible pulpitis. During caries removal, accidental pulp horn exposures occurred. Haemorrhage was washed out with water. MTA (ProRoot[®] White) was applied, covering the pulp horn exposures and some minutes later a provisional restoration was placed (Duotemp[®]). Two weeks later, the cold and percussion tests were within a normal range and final restoration was placed. In each follow-up, the cold and percussion tests were within a normal range and the radiographs also confirm no periapical lesion.

Discussion The good sealing properties of MTA avoid bacterial leakage after the removal of the infected dentine. This seems to be a very important factor to prevent pulp inflammation. The biocompatibility of MTA promotes cell survival and proliferation and the formation of hard tissue on the pulp exposure area.

Conclusions and Clinical Relevance Agenesis of a permanent tooth can be a challenging situation to plan an orthodontic treatment. In these cases the maintenance of the function and vitality of the primary tooth is of paramount importance. Direct pulp capping can be an alternative treatment to preserve pulp vitality of primary teeth.



Importance of using CBCT for the clinical diagnosis of root fractures *Pérez Cepero A, Maeso Martínez E, Herrera Trinidad R, De la Rosa Rico A, Nieto de Pablos JM Master Degree of Endodontic, USP-CEU, Madrid, Spain

Aim to evaluate the importance of the come beam computed tomography (CBCT) in the diagnosis of periapical lesions root fractures. As far as can be achieved in endodontics and the benefits compared to traditional two- dimensional images managed up to now.

Summary A second mandibular molar is presented with a suspect of fracture in conventional radiograph, After doing a CBCT it was seen that there was a fracture made by a failed post, it also made some apical pathology. Other subject came to the office with a first mandibular molar with a failed endodontic treatment, it was found two periapical lesions in radiograph. After doing a CBCT, it was seen a great injury in the distal root, associated to a post, and independent to the apical lesions, that told us that there was a root fracture So that, the manage of the CBCT in the mentioned cases, understand why has been used and the information provided for the diagnosis is a necessary tool for the clinician to stablish an adequate treatment plan for similar cases.

Key learning point

- CBCT is a basic tool in the endodontics field against lesions that we cannot suspect with a conventional radiography.
- The CBCT can be used with high sensitivity and specificity to detect the presence and absence of periapical and perirradicular pathology that allows the clinician to stablish the best treatment plan.

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The endodontic retreatment - Always the first solution when treating Chronic Apical Periodontitis *Diaconu OA, Gheorghita LM, Tuculina M, Petcu C, Moraru IA, Bataiosu M, Moldoveanu GF Department of Endodontics, Faculty of Dental Medicine, ¹Craiova, ²Bucuresti, Romania

Summary There are several factors causing the failure of the endodontic treatment. One of these factors is the lack of knowledge (or rather the ignorance) regarding the internal anatomy of the endodontic space. In the cases of the inferior frontals, this type of failure might often appear due to errors in preparing the access cavity, which eventually leads to omitting the instrumentation, the lavage and the obturation of the second canal. The clinical case presented was cured through retreating the teeth in question and monitoring the healing process of the apical lesions, both radiological monitoring and through CBCT, after 6, 12 and 24 months.

Treatment approaches to horizontal root fractures: A report of two cases *Bayram ZC, Uyanik MO, Nagas E Department of Endodontics, Hacettepe University, Faculty of Endodontics, Ankara, Turkey

Aim: To represent a late and immediate treatment approaches to horizontal root fractures. Introduction: Horizontal root fractures usually affect the anterior teeth as a result of trauma and diagnosis based on radiographic examination, vitality tests and clinical findings are important to determine the presence of a root fracture and to prevent the fracture from passing unnoticed. Case presentation: In case 1; 19 year old male patient came 2 days after a sports accident with a horizontal fracture at the middle-third of the root of maxillary left central incisor. The tooth had been splinted just after the accident by wire ligation without reposing (Fig. 1). The wire ligature was removed (Fig. 2); the tooth was reposed and splinted semi-rigidly; diagnosed radiographically (Fig. 3,4,5) and tested as vital to electric pulp test during 6 months (Fig. 6). Second case was 30 years old male patient who were referred to the Endodontics Clinic because of a tenderness to hot and cold stimuli at maxillary right central incisor. After radiographic examination, a horizontal root fracture was detected at the suffered tooth due to a trauma 15 years ago (Fig. 7). The tooth became symptomatic 15 years after trauma. The tooth exhibited slight mobility, no tenderness to palpation and percussion and EPT(+). Firstly the tooth splinted by using composite resin (Fig. 8). The next day, the patient came again and stated continuing sensitivity to thermal stimuli. After anesthesia and isolation procedures, the access cavity was opened and the coronal fragment of the root cleaned by NaOCI irrigation copiously, shaped minimally and intermedicated by CaOH for two weeks (Fig. 9). When the tooth became asemptomatic, coronal root fragment obturated by Biodentine (SeptoDent) and restored by composite resin, followed by splint removal (Fig. 10). A follow up radiography was taken after a year (Fig. 11).

Conclusion and Clinical Relevance:

- Horizontal root fractures generally heal spontaneously depending on the vitality of the pulp The healing of the tooth was likely to be related to interproxima connective tissue healing
- Diagnosing radiographically and vitality tests were the main procedure without the need for any other treatment techniques
- The fracture was limited only to the root area, alveolar bone wasn't affected, the patient was young and had a good oral hygiene; and they were considered to be positive prognostic factors



Fig. 1 Initial



Fig. 2 1st week

Fig. 3 3rd week



Fig. 4 5th week



Fig.5 10th week Vitality Score: 4



Fig 10 **Biodentine obturation**



Fig. 6 6th month Vitality Score: 2



Fig I I First year



Fig 7 Diagnostic radiograph



Fig 8 Splint application

Fig 9

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Treatment of internal root resorption with mineral trioxide aggregate and glass- fiber modified composite: a case report.

Authors: Kukurba-Setkowicz M, Żarow M, Paulo M, Ramut K Institution: Private dental office Dentist, Krakow, Poland

Aim: To present a treatment and follow-up of a patient with an internal resorption in the maxillary central incisor treated with the aid of a glass-fiber reinforced composite for core build-up.

Introduction: Internal root resorption is a pathological process that leads to the degradation of cement or the degradation of cement and dentine.

Case report: This study presents a case of an extensive internal root resorption affecting a tooth number 11 in a 39-year-old patient. Some of the complicating factors included a substantial loss of tooth structure, resorption located in the middle third of the root (Fig.1) and a perforation with lateral periodontal communication diagnosed with CBCT (Fig.2). The root canal was prepared using ProTaper system under visual control of an operational microscope. Preparation was completed using the instrument F5, WL = 23 mm. The canal was irrigated with 5.25% sodium hypochlorite solution during preparation and after its shaping (with ultrasonic activation for 60 seconds). For smear layer removal a 15 % EDTA solution was used for 60 seconds. At the end of preparation, the canal was flushed with a solution of sodium hypochlorite for 15 s. The apical part of the canal up to the level of resorption was obturated with thermoplastic gutta percha. The resorption site was covered with MTA. The levels of tightness of root canal filling and resorption sealing were verified with CBCT (Fig. 3). Since the tooth had been weakened by a substantial loss of tooth structure, the pulp chamber and the coronal third of the canal were rebuilt using a glass-fiber modified composite (everX Posterior).

In the follow-up radiographs over next 12 months, the tooth was functional without endodontic pathosis (Fig. 4).



Fig.1 Initial x-ray image.

Fig. 2 Initial CBCT.



Fig. 3 Control CBCT images immediately after the treatment.

Conclusion & Clinical Revelance

- Diagnostic CBCT is critical in the planning of root canal re-treatment of a tooth with internal resorption.
- Filling a resorption cavity with MTA and glass-fiber modified composite represents an effective alternative for routinely used glass-fiber post after endodontic treatment.



Fig.4 Follow-up x-rav image after 12 months.

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Management of large pulp-floor perforation with tricalcium silicate-based cement: a case report *Vukotić O¹, Mladenović I¹, Žuža A², Cicmil S¹

Departments of ¹Oral Rehabilitation, ²Department of Restorative Dentistry and Endodontics, Faculty of Medicine, University of East Sarajevo, Foča, Bosnia & Herzegovina

Aim This case report describes the management of a large pulp-floor perforation in a maxillary first molar.

Summary A healthy 19-year old woman presented for consultation after complications had occurred during endodontic treatment. The patient complained of episodes of pain during previous root canal procedure. Clinical examination showed that the maxillary right first molar had large temporary restoration, was tender to percussion and exhibited normal mobility. The periodontal condition was normal. Radiography showed previously insufficient endodontic treatment, but without periradicular or furcation radiolucency (Fig.1). The temporary filling was removed and iatrogenic pulp-floor perforation was diagnosed on the distal area of cavity floor (Fig.2). The defect was repaired with tricalcium silicate-based dentin replacement material (Biodentine, Septodont, Saint-Maur des Fossés, France). After a few days endodontic treatment was completed and tooth was restored. An 18-month recall showed no evidence of periodontal breakdown and absence of any clinical symptoms (Fig.3). **Conclusion** Tricalcium silicate-based cement appears to provide a long-term effective seal for pulp-floor perforations.





Figure 1. Initial radiograph suggesting pulp-floor perforation

Figure 3. Recall radiograph - 18 months follow-up



Figure 2. The mirror view of the pulp chamber floor shows perforation on the distal area of cavity floor

Follow-up of one case of periapical actinomycosis as a consequence of dental trauma. *Santos AEC¹, Teixeira AP¹, Freire MV¹, Risso PA¹, Abrahão AC² ¹Department of Clinic, ²Diagnosis and Pathology Department, Federal University of Rio De Janeiro, Rio Dejaneiro, Brazil

This work it is a case report of a male patient, 13 years old, who presented an apical periodontitis after dental trauma in both lower central incisors. The patient presented pulp necrosis, periapical lesion and an abscess with extra-oral fistula. Endodontic therapy was performed, but the sinus tract remained draining. The material submitted to bacterioscopy and culture revealing the presence of Actinomyces spp leading to the diagnosis of periapical actinomycosis. An antibiotic therapy program was performed for six months and was observed complete regression of the sinus tract. A CT examination was performed and showed a hypodense area that underwent curettage. Histopathological examination showed the presence of fibrosis and absence of Actinomyces colonies ssp. After of 8 years follow-up, radiographic images as well as the cone beam tomography are consistent with repair. The diagnosis of periapical actinomycosis is a challenge due to its non-specific clinical features. The differential diagnosis was of paramount importance in this case of dental trauma.

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Nonsurgical retreatment using magnification: a case report with 18 months of follow-up. *Barreto J, Davalos M, Abella F, Roig M Department of Endodontics, International University of Catalunya, Barcelona, Spain

Aim The aim of the non-surgical retreatment is to access the pulp chamber and remove the filling materials found within the root canal, later to negotiate, disinfect and obturate to the established working length. The literature mentions that there are different filling materials that can be found inside the root canals and various techniques to remove them.

Summary A male patient came to the dental clinic to evaluate the tooth 4.6. The patient was symptomatic to percussion and an apical radiolucency was evident on the mesial and distal roots, compatible with apical periodontitis. Also, a post in the distal root and two silver points on the mesial root were observed. The diagnosis was symptomatic apical periodontitis and the treatment planning was to perform a nonsurgical endodontic retreatment. Reciproc 25 was used to clean and shape the canals and vertical condensation technique, to obturate them. Finally the patient was referred to a specialist for the final restoration.

Key learning points

- Using magnification and ultrasonic tips can be helpful when performing nonsurgical endodontic retreatment to minimize iatrogenic errors during the procedure.
- The use of apex locator to determine the correct working length increases the percentage of success.
- It is important to place the coronal restoration to prevent micro leakage.



Long term results of mandibular first molar after root separation and prosthetic rehabilitation

Elżbieta Bołtacz-Rzepkowska, Joanna Kunert

Medical University Lodz, Conservative Dentistry Department

Aim: Presentation of the 10 year follow up results of the first mandibular molar after endodontic treatment, root separation and prosthetic rehabilitation. Introduction: Reconstruction of the teeth with furcation involvement after root canal treatment often requires endodontic surgery procedures. Summary: The patient, aged 52, applied for reconstruction of tooth 46. Clinical and radiological examination showed missing lingual wall and extensive MOD filling of composite material. The X-ray presented a definite contrast in the canals and minor lesion in the peripical region of the mesial root (Fig.). It was decided to commend re - endo treatment, which was carried out in adherence with widely recognized standards. Due to the very thin pulp chamber floor and the lack of bone support in the furcationarea, a decision was taken to separate the roots (Fig.2). The procedure was carried out under block anesthesia. A diamond drill, flame in shape, size 014, was used in order to separate the roots. The wound was flushed with 0.02% chlorhexidine and dressed with periodontal dressing Peripac (Dentsply DeTrey GmbH, Germany) for a period of 5 days (Fig.3). Prosthetic treatment commenced after the healing of the soft tissue. The first stage included a construction of an individual cast metal post in each root. Next, jointed metal - ceramic erowns were cemented to these prepared abuttments. During the prosthetic procedure, phosphate cement Harvard Cement (Harvard Dental International GmbH, Germany) was applied. X-ray tests were taken one (Fig.4), five (Fig.5) and ten years (Fig.6) after the final treatment. At present, the clinical and radiological images of the treated tooth do not show any pathological lesion in periapical region. The patient, aged 52, applied for reconstruction of tooth 46. Clinical and radiological examination showed Discussion: In the presented case, the decision about roots separation of the tooth was correct and combined with suitable prosthetic rehabilitation, resulted in long-term and correct functioning of the tooth in the oral cavity. **Conclusions and Clinical Revelan** Teeth with advanced furcation defects (Class II) usually require surgical management: hemisection or root separation and appropriate prosthetic rehabilitation. References Huynh-Ba G et al. The effect of periodontal therapy on the survival rate and incidence of complications of multirooted teeth with furcation involv a systematic review. J Clin Periodontol. 2009 36,164-76
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Partial Pulpotomy in a Permanent Maxillary Left Central Tooth with Hyperplastic Pulpitis: A Case Report



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Aim: This case report describes the clinical and radiographic outcome of the treatment of a permanent central tooth with hyperplastic pulpitis using Mineral Trioxide Aggregate (MTA).

Introduction: Partial pulpotomy is a pulp therapy in which a portion of damaged and inflamed coronal pulp tissue is removed. The wound surface is treated with a dressing agent to promote healing and maintain vitality of the remaining pulp tissue.







Case presentation: A 19-year-old male suffering from profound caries defect and discoloration in his maxillary left central tooth was referred to our clinic (Fig. 1). Tooth responded within normal limits to electrical pulp tests. No history of spontaneous pain, mobility or tenderness to percussion was noted. Radiographic examination revealed an enlargement towards the periodontal ligament of the tooth (Fig. 2). It was diagnosed as hyperplastic pulpitis. Partial pulpotomy was planned and informed consent was obtained from the patient. Gingival tissue was removed with laser. White MTA was placed over the amputated coronal pulp tissue and covered temporarily with glass ionomer cement (Fig. 3 and 4). The patient was re-called after one week to asses if there was any sense of postoperative pain caused by the treated tooth (Fig. 5). No postoperative sensitivity was noted. The temporary restoration was removed under aseptic conditions; MTA was then covered with glass ionomer cement again. In the same appointment, the tooth was restored with resin composite.









Discussion: Examinations 6 months after the treatment revealed success with the observance of normal function, esthetics with a vital pulp and healthy surrounding periodontal structures (Fig. 6 and 7).

Conclusions and Clinical Relevance: This case report showed that MTA is an effective vital pulp therapy agent for treating human permanent central tooth with hyperplastic pulpitis, relieving associated pulpal symptoms and preserving pulp vitality. It is able to stimulate hard tissue bridge formation. Further researches with longer follow up are needed to clarify the conclusion.

Actinomycosis as a consequence of dental trauma. *Santos AEC¹, Teixeira AP¹, Freire MV¹, Risso PA¹, Abrahão AC² Departments of ¹Clinic, ²Pathology And Oral Diagnosis, Federal University Of Rio De Janeiro, Rio De Janeiro, Brazil

Aim This paper presents a case report of a male patient, 13 years old, who presented pulp necrosis, periapical lesion after dental trauma in both lower central incisors. The patient also had a abscess with extraoral sinus tract. The purpose of this case report is to show the need for a differential diagnosis of actinomycosis in cases of dental trauma.

Methodology After periapical radiographs and confirmation of pulp necrosis endodontic therapy was performed, but the sinus tract remained draining. It's material was submitted to bacterioscopy and culture. An antibiotic therapy program was performed for six months. A CT examination was performed and showed a hypodense area and lesion's surgical excision.

Results The material submitted to bacterioscopy and culture revealing the presence of Actinomyces spp leading to the diagnosis of periapical actinomycosis. After six months of antibiotic therapy was observed a complete regression of the sinus tract. Histopathological examination showed the presence of fibrosis and absence of Actinomyces colonies ssp. After of 8 years follow-up, radiographic images as well as the cone beam tomography are consistent with repair. **Conclusions** The diagnosis of periapical actinomycosis is a challenge due to its non-specific clinical features. The differential diagnosis was of paramount importance in this case of dental trauma. **Acknowledgements** CNPQ- Conselho Nacional de Desenvolvimento Científico e Tecnológico CAPES-Coordenação de Aperfeiçoamento de Pessoal de Nível Superior

Clinical description of a technique/material GE191

Vital pulp therapy for mature permanent teeth: can it replace conventional RCT of vital teeth? *Fazlyab DR, Asgary PROF, Eghabl PROF

Iranian Center for Endodontic Research, Research Institute of Dental sciences, Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran

Aim The aim of vital pulp therapy (VPT) is to preserve the vital pulp in mature/immature permanent teeth by removing the inflamed zone of pulp.

Methodology In permanent teeth, VPT includes removal of the inflamed portion of the vital pulp. Depending on the amount of tissue removal, the procedure is followed by direct/indirect pulp capping and partial/miniature/coronal pulpotomy using pulp covering (bio) materials and stimulation of dentinal bridge formation as a natural barrier.

Discussion Many of the dental treatments are done by general practitioners and not all patients can benefit from standardized RCT by endodontists. This can justify the low overall survival rate of endodontically treated teeth. On the other hand, there is a cause-and-effect association between patients' socioeconomic status and health-caring concerns. In every community there is a social class of population with low dental 10 who do not want to or cannot afford RCT and if they seek for dental treatment, they are more likely to experience extraction and edentulism. Moreover, it is impossible to determine the (ir) reversible nature of the pulpitis based on clinical symptoms. Now that pulp regeneration has become the top goal in modern endodontics, extirpation of the existing vital pulp does seem logical anymore. Based on the results of many randomized clinical trials with up to 5 years follow up, VPT has a high success rate provided that *i*- the remaining pulp is not inflamed; *ii*-hemorrhage is properly controlled; *iii*- a biocompatible, bioregenerative capping material is applied; and *iv*- a bacterial-tight seal is present.

Conclusions *VPT* of permanent teeth has a notably high success rate provided that the patients are meticulously selected. This treatment is more easily learned and applied by general practitioners and

it can be a substitute to conventional RCT if the patient is suspected to choose EXT as an alternative. By maintaining the vital pulp the survival prognosis of teeth is elevated. Moreover, in case of treatment failure, RCT remains as an available option.

GE192

Saving hopless teeth *Yoshimatsu HY1 Yoshimatsu Dental Clinic, Tokyo, Japan

Aim It has been more than decades has passed in the field of dentistry when implant treatment was introduced and became a common prosthetic method for edentulous areas. On the other hand, there is an increase in numbers for those cases which we, Endodontic specialist, recommend implant treatments after extraction for the treatment of those teeth diagnosed as hopeless.

Summary This is not to criticize implant treatment but I personally believe it is important for us to broaden the treatment options of the root canal retreatments, enabling us to accommodate demands of their chief complaints.

In this lecture the Endodontic case which had been diagnosed as a hopeless tooth under the conventional theory of Endodontic treatment, performing removal of infected dentin under a magnified view, avoiding those common secondary disaster such as root perforations and/or root cracks caused from the root canal re-treatment. And at the same time, minimize the number of remaining bacteria in a canal results to maintain the low bacteria rated to avoid extraction. Regarding the case of root canal perforation, the development of MTA cement enabled to save those teeth which we could not expect a good prognosis. Further evolution on MTA took place by VerioDental of Canada to develop and launch Bioaggregate. Also, the sealer type and putty type of MTA later launched in the market.

Additionally, in the field of adhesive dentistry, I believe that the 4-META resin developed in Japan would enable us to preserve fractured teeth occasionally.

Recently, we can find many topics on Endodontic specialists in Implant treatments but I wish that my lecture would become a one of the guiding light to encourage those colleagues who wish to broaden out the treatment options of the root canal retreatments to accommodate needs of patients.

Key Learning Points

• How to save hopeless teeth by using BioAggregate

GE193

Importance of manual instrumentation combined with rotary instrumentation in complicated anatomies

*Fuente Martín A, Andrés Hernando C, Juárez Navarro I, Garrido Lapeña P, Rodríguez Arrevola N Institución Universitaria Mississippi, Madrid, Spain

Aim To demonstrate that, with a good manual instrumentation, it is possible to perform root canals treatment in teeth with a complicated root anatomy.

Case presentation A 19 years old female patient, with no relevant medical history, attended to the clinic for a filling at the #3.7 which presented occlusal decay. The response to percussion was negative, slightly augmented normal vitality and normal periodontal probing. In the radiological examination we observed a root anatomy of high difficulty (90 degree curve at the apical third). The cleaning and shaping of the only canal, in this case, was manual with K files up to an apical diameter of #25, through an irrigation protocol with sodium hypochlorite 5'25% and EDTA in gel, to getan easy penetration. The rotatory files selected for the shaping of the canals were Pathfile® (Dentsply Maillefer), Scout RaCe® (FKG Dentaire) and ProGlider® (DentsplyMaillefer). A fragment of the Proglider® file was separated due to the 90 degree angle in the root and we could solve that problem by removing that fragment. To finish cleaning the canal and shaping the canals, the

instrumentation used was ProTaper Next[®] X2 (Dentsply Maillefer), and we did a final wash with sodium hypochlorite 5'25%. Warm vertical condensation technique was used to fill the canals (Elements[®] sealing unit, System B and Extruder), and AH Plus was used as sealant.

GE194

Wear evaluation of innovative HyFlex EDM after clinical uses: preliminary results *Iacono F¹, Pirani C¹, Generali L², Gandolfi MG¹, Prati C¹

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Aim Recently introduced HyFlex EDM NiTi files were evaluated under ESEM/EDS to examine the impact of clinical uses on their superficial characteristics.

Methodology Curved canals of multi-rooted teeth were selected on the strength of their anatomy and endodontically treated by a single-trained-operator. Canal patency was verified with a manual K-file #10. The used operative rotating sequence was: 25/12 at 2/3 of the WL, and 25/08 at WL at 500 rpm and 2.5 Ncm. Five sequences of HyFlex EDM (Coltène/Whaledent, Switzerland) were used to instrument 10 canals each. Irrigation was provided with 5% NaOCI and 10% EDTA (Ogna, Muggiò, Italy). The endodontic procedures were verified and confirmed with intra-operative and post-operative periapical radiographs. HyFlex EDM files were autoclaved after each treatment and discarded after 10 canals. The ESEM/EDS analysis was conducted postoperatively at increasing magnification, from 70X to 5000X, on the tip and on cutting edges at 5 mm from the tip, to detect surface characteristics and to identify the wear features. The wear degradation was evaluated in order to verify the appearance of fractures, unwinding, microcracks, blade disruption and tip deformation.

Results No instruments fractured and no macroscopic signs of deformation were reported. Files 25.08 and 25.12 remained intact, never reporting plastic deformations, spiral unwinding or microscopic signs of wear. Considering the significant increase of diameter and taper, and the high stress the files were subjected to, the absence of degradation was remarkable. This finding would confirm the 25.08 instrument as a "one file" while the use of 10.05 and 25.12 can be considered optional. Radiographic evaluation of endodontic treatment demonstrated that the original canal anatomy was respected.

Conclusions No plastic deformations or microscopic signs of wear were reported on severely stressed files. Within the limitations of this preliminary evaluation, the present "one file" technique of HyFlex EDM resulted suitable for shaping multiple curved root canals.

Acknowledgements The authors deny any conflict of interest related to this study and would thank Coltène Whaledent for providing the tested material.

GE195

The current importance of ultrasonic in Endodontics Aguilar F¹, *Ramirez A² Department of Endodontics, International University of Catalunya (UIC), ¹Lisboa, Portugal, ²Barcelona, Spain

Aim

The evolution of ultrasounds in dentistry began in the early 50s of the twentieth century, being used today in cleaning processes, such as the removal of tartar and in asepsis, and in some areas of dentistry such as periodontics, endodontics and surgery.

Methodology In this work it is made a review of several studies, in the use of ultrasounds in the field of endodontics, in order to understand the applications in which ultrasound may be useful and what are theirs advantages over other techniques. For the matter, a literature search was made, using the PubMed search engine and the library of Dental Medicine, University of Porto. There were used the following keywords: "endosonics", "cavity preparation ultrasonics in endodontics", "post removal", "passive ultrasonic irrigation", "ultrasonic tips", "periapical surgery", "root end cavity". **Conclusion** It is concluded that the ultrasounds bring advantages in many applications in the field of endodontics: in the preparation of cavity access, in removing obstructions intra canals, in potentiating the irrigation and disinfection of the root canal system, in the condensation of the gutta percha, placement of MTA, in endodontic surgery and also in the preparation of the root canal. **Clinical review GE196**



Institución MISSISSIPPI 🔄 Universidad 🛓 de Alcalá

Revascularization/ Regenerative Endodontic Alonso Núñez P; Bernabé Barrrios E; García Martos P; Andrés Hernando C; Rodríguez Arrévola N

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- Introduction: The endodontic regeneration, also known like revascularization or revitalization, was described by Nygaard-Ostby and Hjortdal in 1961, who demonstrated the growth of a connective fibrous tissue inside the root canal in a tooth with necrotic pulp. Regenerative endodontic procedures designed to remplace damaged cells and structures in the pulp-dentine complex with live viable tissues which restore the normal physiologic functions. Regeneration can be achieved through the activity of cells from the pulp, periodontium, vascular or immune systems. 1)
- 2) Aim: Update in revascularization.
- Materials and methods: Review of articles published from 2008 up to the current date. 3) Key words: Revascularization, regenerative endodontic, revitalization, maturogenesis, etiology, indications, diagnosis, treatment.

4) Results / discussion:

- Concept: A great controversy on the terminology that it should be used. The apicoformation, method that induces a barrier calcified in a root with open apex, allows the use of a material of obturation. With the apicoformation does not recover the vital tissue of the canal. Nevertheless, the apicogenesis is indicated to treat teeth that have not lost the vascularization and the maturogenesis consists of restoring the physiological development of the root.
- Disadvantages: Unknown time of treatment; In occasions, there is neither increase of length nor thickness radicular, not closing of apex; need of bled and formation of clot; size of foramen apical; oblicration of canals; antibiotic resistance and frontal discoloration; ignorance of the formed tissue in the canade and eccentrality to frequere for calcium hidroxide or TAP.
- Histology: 4
 - Several types of stem cells: DPSC (stem cells of the pulp dental), SHED (stem cells of the primary lost teeth), SCAPS (from the papila apical) and PDC (stem cells of the ligament periodontal).
 - Growth factors: proteins that join cells' receivers and work as signs to promote the cellular proliferation
 - and differentiation
 - The scaffold: matrix which provides a favorable environment for organization, proliferation, differentiation and cell regeneration

Name	Year	Type of formed tissue found in the canals
Torabinejad	2012	Lightly cellular fibrous conjunctive tissue, fibroblasts, blood vessels, lymphocytes, no evidence of odontoblasts. Pulpar tissue.
Shimizu	2013	Mineralised tissue newly formed similar to the cement with lagoons of osteocytes.
Martin	2013	Mineralised tissue of cementoide or osteoide nature.
Becerra	2014	Connective soft tissue similar to the periodontal ligament and hard tissue similar to the bone.

Technique:

- 1. Decontamination of the system of canals (minimal or no instrumentation),
- 2.Irrigation with NaCl 1,25-6%,CHX 0,12-2%,H2O2 3%.

3.Dry with paper points.

4.Intracanal medication, most commonly in the form of a triple antibiotic paste (metronidazole, ciprofloxacin and minocycline. Alternatives to the minocycline, due to the fact that it produces discoloration of the teeth: amoxicilina, cefaclor, and doxiciclina. Nosrat et al shows Augmentine like an acceptable alternative). Calcium hydroxide and formocresol have been used too.

5. Removing the medicine with irrigation, EDTA 17%.

6. Overinstrumentation to induce bleeding into the canal space(Stop bleeding 3mm from cement-enamel joint). Alternatives to the clot: PRP or AFM.

7. In the end, placement of an MTA barrier and glass ionomer on the clot before sealing the access cavity.

with a permanent restoration.

Follow-up: No pain or soft tissue swelling, resolution of apical radiolucency, and increased width of root walls and root length.

Indications: Immature teeth with an open apex, apical periodontitis and not formed roots, avulsed teeth and dens in vaginatus.

Regeneration 4, 587–14.Kumar H, Mained Pulp P

5)

Conclusions: It is an option of treatment better than traditional procedures of apicoformation because it achieve to continue radicular development. The features for its success are: absence of intracanal infection, a good sealing, a physical scaffold, growth factors and stem cells. There is no firm consensus concerning any clear treatment protocol for completing the revascularization process.

Treatment for Permanent Treth with Necrotic Pulp and incomplete Root Development J Ended 2013 . J Ended 2013;9:759-763. Jakabus G, Shah N, Logani A, Revascularization with and without Pla with Resentative Endedottics and Apevification in the Same Patient A Case Report and Review.

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Clinical review Endo-perio lesions: clinical management of the different classification entities. A review *Ruiz XF, Mercadé M, Durán-Sindreu F, Roig M Department of Endodontics, Universitat Internacional de Catalunya, Barcelona, Spain

Aim To describe the different treatment options depending on the etiology and the classification of the diverse endodontic-periodontal lesions.

Summary Cross-seeding of mixed anaerobic bacteria has been reported as the primary cause of the development and progression of endo-perio lesions. Entrance of bacteria can occur from the root canal to the periodontum or vice versa through different communication pathways: anatomical or iatrogenic defects. Endodontic-periodontal lesions represent a great challenge to the professionals when diagnosing and evaluating their prognosis. It is important to know the origin of the lesions and the interrelationship between endodontic and periodontal disease when treating this kind of patologies. Simon et al. in 1972 classified the real endo-perio lesions according to the true origin of the disease: 1) primary endodontic lesions with secondary periodontal involvement, 2) primary periodontal lesions with secondary endodontic involvement, and 3) true combined lesions. This literature review pretends to describe the classification of endo-perio lesions, their diagnosis, prognosis and to evaluate and illustrate the different clinical management of these lesions according to the type of defects, including root perforations, vertical root fractures, root resorptions, anatomical defects such as invaginations or palatal grooves and true combined lesions. **Key learning points**

- Endo-perio lesions represent a challenge to clinicians in the diagnosis and the management of these lesions and treatment options should be addressed depending on the knowledge of the etiology, the origin and the classification of the entity.
- The prognosis of endodontic-periodontal lesions should be considered carefully and treatment will be chosen also depending on the restorability and functionality of the tooth, the cost, the length and how invasive the approach is.



The clinical case of treatment of apical granuloma patient with arterial hypertension: a case report.

Ksenija Matsepuro, Alexander Mitronin, Moscow State Medical Stomatological University, Dept. of Endodontics.

Aim. to establish a clear algorithm of treatment, to indicate the proper application of methodologies wich includes methods to estimation of functional activity of sympathetic-adrenal system.

Introduction. Patients with arterial hypertension deserve special attention, as they are more susceptible to anxiety before the treatment, so during the painful manipulations with the use of local anesthesia, the importance of evaluation and correction of psycho-emotional state of such patients. The lack of clearly developed approaches for correction to dental intervention, directly affects the quality of their dental care. The peculiarities of the management of patients suffering from arterial hypertension.

Case presentation. A 35-year-old woman was applied about tooth treatment 2.4. According to the patient tooth was bothering month, periodic pain. The tooth cavity was open, percussion is painful to observe, palpation at transition crease slightly painful. On x-ray tooth 2.4 (Fig. 1) there is a widening of the periodontal gap all over, filling material in the channels is not traced. DS 2.4 chronic apical



periodontitis (apical granuloma) of the ICD-10 - K.5. In the first visit of the patient during blood pressure measurements were obtained figures 160-100 mm Hg. When interviewing the patient noted a fear of treatment, slight dizziness. For consultations was caused by an anesthesiologist. Was studied the activity of the sympathoadrenal system the value -46.5, wich indicating the increased

activity of sympathoadrenal system. Fig.1

Discussion. Compliance with all the steps of endodontic treatment, application of the newest technologies and materials allow for a quality endodontic treatment, eliminate inflammatory reaction from the side of endodont and periodont disease, and to stimulate reparative processes in the bone tissue without significant impact on the health of other organs and body systems.





Fig.3

Conclusions and Clinical Relevance. Correct diagnosis, compliance with all stages of endodontic treatment, the use of advanced technologies and materials, a timely connection to the work of an anaesthetist enable to treat patients with elevated blood pressure (Fig.2, Fig.3).

Clinical review VITAL PULP THERAPY IN PERMANENT TEETH WITH IRREVERSIBLE PULPITIS *Reis A¹, Quaresma S¹, Abella F *Department of*, Dúran-Sindreu F² *Department of Endodontics, International University of Catalunya (UIC),* ¹ *Lisboa, Portugal,* ²*Barcelona, Spain*

Aim To illustrate the diagnosis and management, as well as the clinical and radiographic success of vital pulp therapy (VPT) in vital permanent teeth with irreversible pulpitis

Methodology A search was conducted in PubMed, with the keywords: "irreversible pulpitis", "vital pulp therapy", "permanent teeth", "vital pulp therapy irreversible pulpitis", "new materials" and "pulp repair and regeneration" in the past 5 years, evaluating the influence of certain factors in the success of the reparative/regenerative treatment such as accessing the condition of the pulp, age of the patient and stage of root development, the degree of pulp bleeding, the method to control pulpal hemorrhage and type of biomaterial used.

Results The current tests available to the clinician make it difficult to accurately diagnose the degree of pulpal degeneration before commencing treatment. Therefore, the clinician's ability to assess the health of the remaining pulpal tissue during the procedure is paramount (example: profuse bleeding that indicates severe pulpal inflammation, lowers the prognosis of VPT). Literature suggests several methods to control pulpal hemorrhage, although without available data as to which method provides the best outcome. It has been recommended that vital pulp treatment should be performed only in young patients with imature teeth. To date, there has not been any published clinical study with statistical significance to support this claim. MTA has been the gold standard but few recently introduced bio-ceramic silicate-based materials like Biodentin, Calcium Enriched Mixture (CEM) cement, Tech Biosealer Endo and BioAgreggate have shown considerable clinical success. However, remains to clarify the different cytotoxic effects of these materials on important cell populations such as fibroblasts and monocyte cells and therefore there is no current evidence to recommend a material over another.

Conclusions A consensus amid literature should be achieved to recognize the progresses of VPT and to incorporate the latest available information into clinical practice and teaching. Further research and clinical trials are also needed to develop case selection and treatment approach guidelines to maximize clinical success and achieve predictable outcomes.

Acknowledgements I express my appreciation to my tutor Sérgio Quaresma and to the co-authors for their advices and knowledges.



Endodontic and periodontal lesions: Classification.

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Aim: To discuss a clinical classification to be consider for accurately diagnosing and treating endoperio lesion.

Summary There is a close relationship between periodontal disease and pulp disease, first described in 1964 by Simring and Goldberg; who established the term of lesion perio-endo", it refers to the periodontal and periapical inflammatory problems in different levels. The perio-endo lesions are classified: i) Primary endodontic lesions with secondary periodontic involvement ii) Primary periodontic lesions with secondary endodontic involvement iii) "True" combined lesions. The different diagnosis of endodontic and periodontal diseases can sometimes be difficult to determinate, but it is of vital importance to make a correct diagnosis for providing the appropriate treatment. Radiographic and clinical evaluation can help clarify the nature of the problem; in some cases, the influence of pulpal pathology may cause the periodontal involvement and vice versa. The treatment and prognosis of endo-perio diseases vary depending on the cause and diagnosis of each specific condition. To achieve a combined success in perio-endo injuries it is crucial to remove these two disease processes. The objective is to discuss a clinical classification to be consider for accurately diagnosing and treating endo-perio lesion

Key Learning Points

- It is important to understand the classification of endo-perio lesions, to thus be able to perform the appropriate diagnostic and treatment plan.
- Primary endodontic lesions with secondary periodontic involvement, after a period of time a suppurating primary endodontic disease remains

GE202

Retrospective evaluation of a reciprocating system in endodontic treatment: a 1.5-year outcome *Azaripour A¹, Weusmann J¹, Mahmoodi B¹, Gerhold-Ay A², Willserhausen B¹ ¹Department of Operative Dentistry and Periodontology, ²Institute of Medical Biostatistics, Epidemiology and Informatics, University of Mainz, Mainz, Germany

Aim The aim of present the retrospective study was to evaluate the efficacy of a reciproc file (Reciproc[®], VDW GMbH) in single visit endodontic treatment in patients from dental school of university of Mainz (Germany).

Methodology A total of 123 (mean age 47.7 \pm 12,3) patients were included in the study. 123 teeth (53 molars, 48 bicuspids, 22 anterior teeth) were prepared with Reciproc[®] single-files and rinsed with sodium hypochloride (3%). All canals were filled vertically with Reciproc gutta-percha cones (VDW GmbH) and AH Plus sealer (Dentsply Maillefer). 3, 6, 12 and 18 months postoperatively, teeth were examined clinically and radiographically by an independent examiner. Healing rate (healing was considered as no clinical symptom or signs and periapical index < 3) was evaluated by obtaining Kaplan-Meier-curves. In order to assess the joint influence of status at root canal treatment, we fitted a proportional hazard model (Cox regression model).

Results 37.39% of treated teeth showed a radiographic lucency prior to endodontic treatment and 22.7% had positive vitality. Postoperative evaluation after 18 months showed a 100% success and apical lucency was reduced to 6.5% (p=0.01). No complications during preparation such as instrument fracture were reported.

Conclusions Single-File preparation of root canals in a single visit treatment is a safe method in endodontic treatment. Long-term studies should be performed to confirm our findings.

Clinical trial

GE203

Clinical and radiographic evaluation of the success of endodontic treatment *Civera Molina D, Pallares Sabater A, Aranda Verdú S Catholic University of Valencia, Valencia, Spain

Aim Our intention is to know which percentage of success we have after a year when we realize an endodontic treatment. The test was done with patients of the Clinic University clinic of the Catholic University of Valencia.

Secondary aims is evaluate the influence of the quality three-dimensional obturation of the root canals, the influence of the quality coronal restoration, and the presence of previous periapical lesions in the successful treatment.

Summary One hundred patients of the Clinic University of the Catholic University of Valencia have collaborated in the study. Patients who had received a root canal treatment on one or more teeth between twelve and thirty six months before the study start, and have a previous and final radiography of their treatment.

Call the patients to come to the clinical university. Realize a clinical and radiographic evaluation of the tooth received an endodontic treatment. First, do a questionary about the presence or absence of tooth pain to know what type of pain the patients feel. Later, realize a clinical examination to evaluate the quality of the coronal restoration, and presence/absence of lesion gum. Finally, do a periapical radiographic, , to evaluate the quality of the root canal obturation and compare it with others (previous and final radiographic) to know the evolution of previous periapical lesion. Data for each patient are collected in personal records. This information will be compared to get the results.

GE204

Premolarization: a surgical alternative in the management of root-filled teeth with persistent apical periodontitis

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Aim When root-canal treatment failed, especially when the furcation involvement is the main problem, premolarization must be considered as a treatment option. Premolarization consists in the individualization of the roots of a multi-rooted molar. This technique allows preserving the mechanical functions of molars with furcal affectation. A case of premolarization of mandibular molar which showed severe bone destruction in the furcation area is reported

Summary A 41 year-old patient presented a root-filled right first mandibular molar with persistent apical periodontitis involving furcation area. The patient was asymptomatic. Taking into account that both mesial and distal periapical areas were unaffected, showing no inflammatory involvement, premolarization was proposed, agreeing the patient after informed consent. Previously, the tooth was restored with bonded amalgam. Then, surgery was carried out, sectioning the molar tooth through the furcation. The two resultant "premolar" fragments were covered with full resin-metal crowns. After 18 months follow-up healing of the lesion is completed.

Key learning points

- When root-canal treatment failed, especially when the furcation involvement is the main problem, premolarization can be a good treatment option.
- Premolarization consists in the individualization of the roots of a multi-rooted molar. 3-Previous adequate root-canal treatment and coronal restoration are needed.

Evaluation of a technique/materials GE205

The comparison of noninstrumented area at one third apical root canal wall between Reciproc[®] and WaveOne[®] oscillation instrument

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Aim To compare noninstrumented area at one third apical root canal wall after instrumented by Reciproc[®] and WaveOne[®] oscillation instrument.

Methodology The single root canal of thirty two human mandibular premolars were filled with china ink and were divided equally into two groups: (1) Group I (n=16): Reciproc[®]; and (2) Group II (n=16): WaveOne[®]. Roots were bisected longitudinally in a buccolingual direction then digitally captured using stereomicroscope with 20x magnification. The images obtained were analyzed using Adobe Photoshop CS5 software. The one third apical root canal walls were evaluated for total canal wall area versus noninstrumented area on which china ink remained.

Results No statistically significant difference was found between the instrumentation techniques studied p=0,265 (p<0.05). But, according to sample counting, Group II showed a better result of the amount of china ink removed in the one third apical root canal walls.

Conclusions The findings of this study showed that both instruments, Reciproc[®] and WaveOne[®] showed no difference effect in cleaning the root canal.

GE206

Effect of motion kinematics on amount of apically extruded debris Cakici F, Cakici E, *Fundaoglu Kucukekenci F Department of Endodontics, Ordu University, Ordu, Turkey

Aim To investigate the effect of motion kinematics on amount of apically extruded debris during root canal instrumentation.

Methodology Ninety extracted mandibular premolar teeth were randomly assembled into 5 groups (n=18). The root canals were shaped using ProTaper Universal instruments system (Dentsply Maillefer, Ballaigues, Switzerland) in group 1, Self-Adjusting File (SAF) system (ReDent-Nova, Ra'anana, Israel) in group 2, Twisted File Adaptive (TFA) system (Sybronendo, orange, CA) in group 3, Reciproc (VDW, Munich, Germany) in group 4 and F2 file of ProTaper working in reciprocating motion in group 5. Debris extruded apically during instrumentation was collected into preweighed Eppendorf tubes. The Eppendorf tubes were then stored in an incubator at ^{7Q0} C for 5 days. The Eppendorf tubes were weighed to obtain the final weight of the Eppendorf tubes plus extruded debris. Three consecutive weights were obtained for each tube. The data obtained were analyzed using one-way analysis of variance and Tukey post hoc tests (p<0.05).

Results A measurable amount of debris was apically extruded in all groups. The highest amount of apically extruded debris was produced in group shaping with F2 ProTaper in reciprocating motion. SAF system produced less amount of apically extruded debris than the other groups. A statistically significant difference was found between SAF and TFA, F2 ProTaper in reciprocating motion (p<0.05).

Conclusion The results of this study showed that motion kinematics have a significant effect on amount of apically extruded debris.

GE207 WITHDRAWN

GE208

Effect of Different Intacoronal Bleaching Agents on Dentin Micro hardness *Uyan HM

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Aim The aim of this in vitro study was to investigate the effectiveness of different intacoronal bleaching agents on dentin micro hardness.

Methodology Sixty intact human maxillary incisors which extracted for orthodontic reasons were used. Teeth were randomly divided to three groups(n=20). Group I: Control group, no bleaching agent was applied. Group II: 35% Hydrogen Peroxide (Opalescense Endo, Ultradent, South Jordan, UT) Group III: 37% Carbamide Peroxide (Whiteness SuperEndo, Dentscare LTDA, Joinville, SC). The walking bleach method was performed for both group II and group III. Bleaching was performed for twelve days and afterwards dentin micro- hardness was measured by Vickers hardness method (SHIMADZU HMV). In order to avoid the measurement errors, all teeth are fixed into acrylic blocks (2 mm apical to the CEJ). Shapiro Wilk test, t- test, u- test and Mann Whitney U test was used for statistical analysis.P < 0.05 was set as significant.

Results The hardness of the control, non bleaching group (Group I) was higher than group II and group III. The group II, 35% hydrogen peroxide(Opalescence Endo Ultradent,South Jordan,UT) micro hardness was higher than group III, 37% carbamide peroxide (Whiteness Super Endo, Dentscare, LTDA Joinville, SC). (p<0,05).

Conclusions The peroxide contain - bleaching agents, weakens the tooth structure via dissolution and decay in the dentin collagen structure and therefore increase the fragility of teeth. **Acknowledgements** No external funding was received for this study.

GE209

Ex vivo evaluation of microcracks formation during the endodontic procedures using a Ni–Ti single rotary file and a Ni-Ti reciprocating file

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Aim The aim of the study was to compare dentine micro-cracks formation when using a Ni–Ti rotary file One Shape(Micro-Mega, Besançon, France) and a Ni-Ti reciprocating file Wave-one(Dentsply-Maillefer,Ballaigues Switzerland)

Methodology Thirty one-rooted, healthy teeth were selected. The teeth were decoronated to obtain a root length of 16mm. Each root was coated with 1mm-thick impression past(light viscosity) in order to reproduce a periodontal ligament. The roots were then embedded in epoxy resin blocks. The samples were divided in 3 groups of ten each: -Group A(control):the root canals remained unprepared -Group B:after access cavity preparation and initial preparation with a #10 K-file, the root canals were shaped with the One Shape file, .06 Taper, #25. -Group C:after the same initial preparation, the root canals were shaped with the Wave One Primary file, .08 taper, #25.A new single instrument was used for each root canal according to the manufacturer recommendations, i.e. crown down sequence in 3 steps. The root canals were irrigated with 2ml NaOCl 2,5% solution and a patency file was used between each step. A final rinse using 4ml NaOCI and 2ml EDTA, agitated with a sonic plastic file (Endoactivator) ended the root canal preparation. Roots were then crosssectioned at 3, 6 and 9 mm from the apex, stained with methylene blue, and rinsed with distilled water. The surface of each cross section was observed on each side, under an operating microscope(Kaps International, Aalen, Germany) at x10 and x40 magnification in order to detect dentine micro-cracks. A score method was apply: 0-no defect or microcracks, 1- dentinal defect, 2internal micro-crack. The Exact Fisher's Test (Chi2 for small samples) was achieved to compare the three groups at each level.

Results There was no statistically significant difference between the Control Group A, the One Shape files Group B and the Wave-one Primary file Group C (p > 0.001).

Conclusions In the conditions of this experiment, no relationship between micro-cracks formation and root canal shaping using single rotary Ni-Ti instruments compared to single reciprocating Ni-Ti instruments were found. The protocol of reproduction of the periodontal ligament and roots embedding in epoxy resin seems to do not affect the results.

Acknowledgements Acknowledgement to Micro-Mega France an Dentsply-Maillefer France, for supplying endodontic instruments.

GE210 WITHDRAWN

GE211

Dissolution of Endodontic Files via a Novel Electrochemical Process: A Systematic Review *Gupta R¹, Betlej A², Patel Y¹

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Aim The aim is to review a new concept of retrieval of fractured instruments from root canals based on an electrochemical process.

Methodology The novel concept of retrieval of fractured instruments by an electrochemical process is based on dissolution of metal alloy in aqueous environments, and it requires the existence of two electrodes and an electrolyte. We did meta-analysis of all available studies on retrieval of fractured instruments using this method. Data from five studies was included after application of inclusion and exclusion criteria. These studies were selected from PUBMED and Cochrane system. All studies were performed in-vitro. Anodic polarization of K3 size 20, 0.06 taper, ProTaper size F1 and MTwo size 20, 0.06 taper instruments was performed, and ANOVA (P < 0.05) was used to compare the weight loss, the time of dissolution and the electrical charge generated by the groups of instruments.

Results Differences in dissolution were observed by type and diameter of the filing system used. K3 instruments had the highest values of total electrical charge, and MTwo instruments the lowest (P < 0.05). The larger is the diameter of the exposed surface cross section, the higher is the total value of electrical charge. K3 and ProTaper instruments had significantly greater weight loss than Mtwo instruments after 30 min of polarization. K3 instruments had the highest values of total electrical charge, and MTwo instruments the lowest (P < 0.05).

Conclusions Efficiency under clinically acceptable time for an endodontic re-treatments has been overlooked in the current literature.Studies focusing on alteration in the diameter of the broken files to engage the smallest file for faster removal are required.Cyclic fatigue separation failure is more common with stainless steel files which should also be emphasized .Nevertheless, further in-vitro and in-vivo studies are necessary.

GE212

Evaluation of a technique/materials Development of copper-rich SMA based endodontic instruments Vincent M¹, *Engels-Deutsch M¹, Thiebaud F², Bel-Haj Khalifa S², Ben Zineb T² ¹Faculty of Dentistry; Lemta, Cnrs Umr 7563, Universite De Lorraine, Nancy, France ²Lemta, Cnrs Umr 7563, Universite De Lorraine, Nancy, France

Aim The aim of the research is the development of endodontic CuAlBe instruments. Two main reasons have led this choice of material; (i) the CuAlBe SMA presents better super-elasticity properties than those of Ni-Ti because the transformation strain is higher for single crystal CuAlBe (about 10%) than for polycrystalline Ni-Ti (about 6%); (ii) the literature demonstrates that surfaces containing more than 55% copper eliminated many resistant pathogenic microorganisms responsible

for endodontic failures. The composition of the CuAlBe alloy in weight is about 87.63% of copper, 11.7% of aluminum and 0.67% of beryllium. Thus, endodontic CuAlBe alloy instruments could be a possible solution to better eradicate the bacteria responsible for persistent endodontic failures. **Methodology** After identifying the single-crystal Cu-based SMA parameters by a classical tensile test, a computer aided design geometry has been considered for a structural analysis by the finite element method. Sensitivity to geometric parameters has been carried out in the case of a combined bending-torsion loading in accordance with ISO 3630-1 and numerical results allowed to purpose optimal geometries suitable for Cu-based single crystal SMA endodontic files. **Results** Geometrical parameters and mechanical properties of 3 endodontic instruments are

Results Geometrical parameters and mechanical properties of 3 endodontic instruments are proposed, predicting better mechanical properties than classical Ni-Ti endodontic files in terms of elastic properties and stress resistance. Nevertheless, the present results are numerically simulated and it may be necessary to carry out experimental tests considering the single crystal CuAlBe instruments under the same conditions as those of studies considering Ni-Ti endodontic files. **Conclusions** A single-crystal CuAlBe endodontic file could therefore realize both a mechanical and biological work allowing a better elimination of microorganism biofilms and a better rate of endodontic treatment success. However, further studies must be conducted before confirm these assumptions.

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GE213

Evaluation of apically extruded debris during root canal retreatment with two different rotary systems followed self-adjusting file

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Aim To compare the amount of debris extruded apically during root canal retreatment using ProTaper retreatment system (Dentsply Maillefer, Ballaigues, Switzerland), ProTaper retreatment system and Self-Adjusting File (SAF) system (ReDent-Nova, Ra'anana, Israel), M-two retreatment system (VDW, Munich, Germany), M-two retreatment system and SAF instruments.

Methodology In total, 72 freshly extracted human mandibular incisor teeth were used. All root canals were prepared with ProTaper universal (Dentsply Maillefer, Ballaigues, Switzerland) F3 file and filled with gutta percha and AH plus sealer using cold lateral condensation before being assembled randomly into four groups (n=18 each). Root canal fillings were removed using ProTaper retreatment system in group 1, ProTaper retreatment system followed by SAF system in group 2, Mtwo retreatment system in group 3 and Mtwo retreatment system followed by SAF system in group 4. Debris extruded apically during the removal of canal filling material was collected into preweighed Eppendorf tubes. The tubes were then stored in an incubator at 70° C for 5 days. The weight of the dry extruded debris was established by subtracting the preretreatment and postretreatment weight of the Eppendorf tubes for each group. The data obtained were analyzed using KruskalWallis h test and then Dunn test for multiple compare.

Results All retreatment techniques caused the apical extrusion of debris. The highest amount of apically extruded debris was produced in group using Mtwo retreatment system followed by SAF system. ProTaper retreatment system produced less amount of apically extruded debris than the other groups. There was no significant difference amount the groups statistically (p>0.05).

Conclusion The results of this study showed that using of SAF system after Mtwo retreatment system and ProTaper retreatment system for improving retreatment has no significant effect on amount of debris extruded apically.

GE214

Comparative study of the impact of dentinal cracks after root canal preparation with files Hy-Flex, ProTaper Next and gates-glidden

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Aim The aim of the present study was to investigate the incidence of apical root cracks after canal preparation with Gates-Glidden drills, Protaper Next (Denstply Maillefer, Ballaigues, Switzerland) and Hy-Flex (Coltene- Whaledent, Allstetten, Switzerland) flaring instruments.

Summary Material and methods: Sixty five human extracted molars were selected. Five teeth were left unprepared and served as a control group. With the sixty teeth remaining we proceeded by doing: cameral access and we instrumented the root canals with Hedströem files until number 20 to working lenght. Then we divided in three groups which were instrumented with the following instruments: Gates-Glidden drills in coronal third (numbers: 2, 3, 4), Protaper Next (with the sequence: SX, X1, X2, X3 and X4) and Hy-Flex files (with the sequence: 08/25,04/20, 04/25, 06/20, 04/30, 04/40)reaching the working lenght. All roots were then sectioned perpendicular to the long axis at coronal, medium and apical third. The sections were then observed under a stereomicroscope. The presence of dentinal cracks was noted. The data will be analyzed using the chi-square test to compare between the experimental groups.

GE215

Comparison of cyclic fatigue resistance of 3 rotary Instruments made of nickel titanium M Wire, CM Wire and Phase R

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Aim Comparison of Cyclic Fatigue Resistance of three rotary systems of endodontics made with nickel titanium M Wire, nickel titanium CM Wire and nickel titanium in Phase R. Evaluation of the influence of different methods of manufacture of three rotary systems of endodontic in their resistance to Cyclic Fatigue.

Summary Materials and Methods: 60 files of nickel titanium were utilized, 20 files Protaper Universal (Dentsply Maillefer, Ballaigues, Switzerland)[®], 20 files HyFlex CM (HyFlex; Coltene Whaledent, Cuyahoga Falls, OH)[®] and 20 files twisted file (SybronEndo, Orange, CA)[®], all of 25 caliber and 0.06 of taper, one artificial canal fabricated in a block of stainless steel, with a length of 18 mm, radius of 3 mm and curvature of 60 grades, using an endodontic motor (maillefer, Dentsply) with a continuous rotation of 350 RPM, the time of fracture was measured using a digital stopwatch counting from the start of the rotation to the fracture of the file. The canal was lubricated with glycerin to reduce the friction and minimize over-heating. The total number of cycles was calculated multiplying the speed of rotation by the time of fracture.

GE216

Analysis of standardization of four heat pluggers *del Pozo Fernández L, Vico García M, Gancedo Caravia L, García Barbero E Máster de Endodoncia, Universidad Complutense de Madrid, Madrid, Spain

Aim The purpose of this research was to evaluate the standardization of .04 and .06 heat pluggers from two different manufacturers, by determining possible discrepancies between the diameters measured on the pluggers at different points and those indicated by the manufacturers. **Methodology** We examined the following groups: B&L Biotech .04 taper pluggers, B&L Biotech .06 taper pluggers, Sybron Endo .04 taper pluggers and Sybron Endo .06 taper pluggers, with 20 specimens each. A silicone impression was prepared for each group of specimens, to obtain a holder that would fix them in a uniform position, We took photographs of each specimen positioned in its holder, On the images obtained, we measured the diameter at 0mm, 1mm, 3mm and 16mm from
the tip, (D0, D1, D3 and D16) of each of the pluggers. The values obtained at the different measuring points were compared with the expected diameters (those indicated by the manufacturers). **Results** None of the analyzed pluggers matched the expected diameters at all four measuring points. Both .06 SybronEndo and .06 B&L pluggers showed more discrepancies than the .04 ones. The greatest discrepancies were noted at D16 in the .06 pluggers, where the diameters were much thinner than expected.

Conclusions Standardization of the heat pluggers tested is not perfect, as they do not exactly present the size indicated by their manufacturers.

Outcome studies

GE217

Accuracy of Cone-beam Computed Tomography and Periapical Radiography in endodontically treated teeth evaluation: a five-year retrospective study.

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Aim This study aimed to evaluate the accuracy of two imaging methods in detecting the apical pathology in endodontically treated teeth .

Methodology A clinical examination from a sample of 156 teeth of patients treated by students of masters in endodontics at the Care Centre of the Faculty of Dentistry at Saint-Joseph University, Beirut was done after 5 years of follow up. Periradicular digital radiographs and a cone beam computed tomography scans were taken and analysed statistically using both the Exact Fisher tests and Mac Nemar tests.

Results The prevalence of lesions was significantly higher with CBCT (34.8%), whereas for digital radiography (13.8%). The CBCT was revealed more precise to identify periapical lesions. As for the clinical success, the rate was 82.5%.

Conclusions Within the limitations of the present study, cone beam computed tomography was more reliable in detecting periapical lesions compared with digital periapical radiographs. **Acknowledgements** This study was granted by the St Joseph University's research fund.

GE218

Comparison of the quality of root canal preparation and fillings completed by dentists and dental students.

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Aim Operator experience can significantly affect the quality of endodontic treatments. Our aim was to compare the quality of root canal fillings performed by dentists and dental students. **Methodology** We evaluated the root canal fillings made by dentist and dental students in year 2012 at the Dental School University of Pécs. Root canal treatments performed with step back preparation and lateral condensation filling technique were investigated. We measured the angle of root canal curvature on preoperative x-rays, and estimated at the level of case difficulty. Three specialists based on clearly defined criteria evaluated the length, the homogeneity and the taper of the root fillings and the visible preparation errors on control X-rays. The statistical evaluation was carried out with a $\chi 2$ test (p<0.05).

Results 318 teeth met/matched the test criteria. 219 root canal treatments (69%) were made by dentists and 99 (31%) by dental students. The proportion of obturations with suitable homogeneity proved to be lower in cases treated by dental students (36.3%) compared to those treated by dentists (50.5%). In mesiobuccal roots of molar teeth the incidence of homogenous root canal fillings also decreased. We found that homogeneity of the root canal filling was influenced by root

position, taper of the preparation, presence of preparation errors and operator experience. Length of the root canal filling was affected by root position, case difficulty and preparation errors. A correlation between case difficulty and preparation errors was revealed. Furthermore inappropriate taper, under-filling and preparation error were significantly associated with the inadequate homogeneity of the root canal fillings.

Conclusions Operator experience influences the homogeneity of the root canal fillings, and so the quality of the endodontic treatment. Quality of root canal filling in our study proved to be similar to previous studies in literature.

GE219

Do piezoelectric units affect implantable cardioverter defibrillators? An in vitro study. *Gómez Val G¹, Roig M¹, Duran-Sindreu F¹, Jara F², Sanchez B², Ferrer R² ¹Department of Endodontics, Univesidad Internacional de Catalunya, ²Pacemaker Unit, Intensive Care Unit Hospital Mútua Terrassa, Barcelona, Spain

Aim The use of piezoelectric units on patients with implantable cardioverter defibrillator (ICD) is generally discouraged, although there is no empirical evidence of the effects of current piezoelectric units on ICD activity in vitro.

Methodology Six piezoelectric units (Piezosurgery 3, Piezotome, VDW.ULTRA, MiniEndo, Suprasson P5 Newtron and Variosurg) were tested for electromagnetic interference (EMI) with the PROTECTATM VR D364VRM ICD connected to a 6947M Sprint Quattro Secure lead. The ICD and lead, was immersed in a saline-solution bath, and adjusted between 300 and 350 ohms to simulate the electrical resistance of the human body and to register and to produce electrographic recordings. The ICD was tested with each ultrasonic device to analyze the presence of EMI, at different distances, with the ultrasound switched on, switched off, and during operation. If any of the devices produced interference, the characteristics of the interference were categorized.

Results In the positive control (direct contact between either the lead or the ICD and the piezoelectric units when this was switched on), the ICD detected electrical activity as false heart activity. Instead, when all the scenarios and distances had been covered, no EMI were produced by the piezoelectric units.

Conclusions No EMI was detected during the testing of the piezoelectric units in this in vitro model of ICD use.

GE220

Evaluation of endodontic radiographic documentation of patients treated by the dental students during their undergraduate clinical training in the department of endodontics, medical university of lodz.

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The quality of root canal therapy performed by General Dental Practitioners (GDP) in different populations has been investigated in many studies, which have shown high percentage of inadequate root canal treatment. The aim of this study was to evaluate dental radiographic documentation of patients referred by the GDP's to the Department of Endodontics, Medical University of Lodz, and subsequently treated by the students during their undergraduate clinical training. On the basis of x-ray records we wanted to characterize endodontic problems in the indicated population, to analyze

needs for endo therapy and to assess the quality of the treatment procedures performed during undergraduate clinical training. Methodology Documentation subjected to evaluation was collected between December 2005 and June 2014 and performed by IV' and ^{Vth} year undergraduate students under the supervision of faculty teacher with the radiation protection guidance. Dental RVG images were taken using Kodak 2000 device with the Kodak Dental Imaging Software 6.11.7.0. Finally, radiograms of 300 patients, 151 males and 149 females aged 14-91 were enrolled for the study. Assessment of radiograms was done independently by two experienced endodontists. The results were statistically verified with software StatSoft Statistica 9.1 PL using Mann-Whitney and Chi-square independence tests. In the indicated period of time 1904 students undergoing their clinical training have performed 13897 of dental x-rays of 5981 patients. Initial dental radiograms revealed the need for endo therapy in 178 incisors, 67 canines, 123 and 97 premolars and molars, respectively. 412 teeth required primary endodontic treatment and in 53 cases retreatment was indicated. In 26% of cases apical radiolucency was detected. Twenty teeth with the visible periradicular changes required retreatment. Control radiograms of 14 patients after long-term observation period were reported. Conclusions In all of the investigated population the need for endodontic treatment was confirmed. Quality of dental x-rays performed by the students allowed to evaluate details of anatomical structures and a status of an examined teeth. On the basis of radiographic database, endodontic treatment performed during undergraduate training meet the standards. Despite thorough information given, patients did not come for x-ray check-ups, which are essential to confirm a success in endodontic therapy.

GE221

Monitoring of the healing process after orthograde treatment in teeth with periapical index – PAI5 *Gusiyska AZ

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Aim The major difficulties in the treatment of chronic apical periodontitis are related to the elimination of microorganisms and their byproducts from the main root canal and microcanal system. The clinical outcome depends on the isolation of the endodontic space from periradicular tissues and create the conditions for an exact sealing - apical and coronal. The clinical study was designed to monitoring the healing process in teeth with PAI5 after orthograde treatment after four years. The treatment protocol was included the use of calcium phosphate ceramic in the apical area to create conditions for definitive root canal obturation.

Methodology 43 single rooted teeth (n = 43) was included in this prospective study with indication of orthograde treatment. It was used a biphasic calcium phosphate ceramic for establishing the apical barrier. Root canals were definitive obturated with a calcium phosphate sealer (iRootSP). Healing process was followed on the 3rd, 6th month, 1st and 4th year.

Results Creating favorable conditions for the sealing of the root canal with clinically diagnosed open apex and application materials for the restoration of the apical lesion with supercritical size leads to a successful healing outcome. 86.3% of clinical cases were asymptomatic and 11.4% of them had a positive reaction to palpation one month after definitive obturation. 97.3% of clinical cases had satisfactory healing results after four years follow-up.

Conclusions The dynamic characteristic of apical periodontitis poses a number of challenges to clinical practice. A modern solution is to restore the damaged bone structure by application of bioactive materials, such as a scafold for the differentiation and development of cellular elements. Establishment of apical barrier missing apical constriction due to pathological or iatrogenic cause is the basis for achieving the best and most lasting results in the treatment of teeth with chronic apical periodontitis.

GE222

Evaluation of patient satisfaction after endodontical treatment

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Aim To evaluate the satisfaction level of patients treated at the Master in Endodontics (ME) of the University of Valencia, Spain (UV) between 2012-14.

Methodology A sample of 157 patients, treated at least 6 month before the evaluation, was randomly selected. A satisfaction survey was developed, including the following items: cost of treatment, duration, comfort, pain along the treatment, dental function and esthetics, as well as a global consideration of the treatment. It was a self-administered and anonymous survey performed during a control appointment. Data were coded following the Likert criteria (1-10) and were clustered in three satisfaction's levels: low (1-3), medium (4-7) and high (8-10). Associated factors related to global satisfaction were analyzed through a logistic regression. A significant level of p<0.05 was considered.

Results 3.2% of patients showed a low satisfaction level, for the 17.8% the level of satisfaction was medium and it was a high level of satisfaction in the 79% of the patients. All items were independent related to global satisfaction. In the multivariant analysis, duration and price were excluded from the model. The remaining variables allowed to establish a model that explained 73.8% of the overall patient satisfaction.

Conclusions Patients treated at the ME of the UV in the studied period were mostly satisfied with the received treatment. Factors related with this satisfaction were: absence of pain, comfort during the treatment, good dental function and esthetics.

GE223

Prediction of pain after root canal treatment . A study by students master endodontic *Cabrera Tarin F, Lerma M, Pallarés A, Aranda S, Civera D Universidad Catolica de valencia, Quart De Poblet, Valencia, Spain

Aim Pain control during and after root canal treatment is one of the most important aspect in the field of endodontics.

1- To investigate the incidence of post-endodontic pain.

2- To investigate post-endodontic pain intensity.

3- To investigate post-endodontic duration of pain.

4-Factors post-endodontic triggers pain.

Summary The research was conducted through a survey of pain assessment, which is given to the patient after treatment. Previously it had been asked to patient consent, and once had agreed to join the study, explaining the survey.

The survey is easily understood by the patient and is assessed using a visual analogue scale (VAS), which evaluated their pain at 24h, 48h, 72h, and weekly. Also contemplated if the patient has needed medication, and whether it has succeeded in controlling pain.

Moreover, the professional performing the treatment fill a number of parameters of the previous state of the tooth, if there is area, spontaneous pain, cold, to chewing ... Treatment performed it a single operator, and could be in one or two sessions as needed treatment.

Results: pending result

Conclusions: pending conclusion

Key Learning Points • pain post-endodontic, pain postoperative, pain intensive, root canal treatment, pain duration

GE224

Impact of endodontic and periapical status on the quality of life *Matijevic J1, Prpic Mehicic G¹, Stipetic J², Simeon P¹, Jukic Krmek S¹

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Aim Endodontic diseases may influence everyday functioning of an individual. Their implications often affect a whole range of patient's performances – health, personal, social, emotional, aesthetic, but also economic ones. The aim of this study was to perform an analysis of radiographic endodontic treatment parameters and periapical status impact on everyday functioning of an individual using an Oral Impacts on Daily Performances (OIDP) questionnaire that measures oral health impacts on daily functioning.

Methodology Endodontic parameters (according to Eckerbom et al.) and periapical status (periapical index – PAI, according to Orstavik) were analyzed on digital orthopantomograms obtained from four regions in Croatia. Total number of subjects was 600. Previously translated and validated Oral Impacts on Daily performances questionnaire was used to assess impacts on the quality of life. Data were analyzed using descriptive, nonparametric, correlation and hierarchical multiple regression analysis statistics in Microsoft Excel and SPSS 17.0.

Results There was a significant correlation between PAI 3, PAI 4 and PAI 5 grades with OIDP questionnaire categories and total score (p<0.05). There was no correlation between the quality and length of obturation and OIDP questionnaire categories and total score (p>0.05). Also, number of endodontically treated teeth didn't correlate with OIDP categories, while the number of missing teeth strongly correlated with OIDP categories and total OIDP score. Regression analysis revealed significant impact of PAI 3 and PAI 4 scores on OIDP results (p<0.05), while PAI 2 and PAI 5 had no significant impact (p>0.05). Also, it was confirmed that missing teeth had greater impact on OIDP score than number endodontically treated teeth and quality of endodontic filling.

Conclusions Results demonstrated that periapical pathology, when present, strongly influences quality of life. Number of endodontically treated teeth as well as technical parameters of the endodontic treatment did not show any influence on the results of OIDP questionnaire. However, missing teeth had a strong impact on the outcome of OIDP questionnaire.

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GE225

Comparison of Cleaning Efficacy of Smear Layer using Two Sonic Irrigation Technique in Apical Third Area

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Aim The purpose of this study was to obtain data on the results of chemomechanical preparation of the smear layer in the apical third of the area is irrigated using two sonic irrigation techniques. **Summary** Root canal preparation will form a smear layer that may prevent root canal filling material pentration into the dentinal tubules at the apical third of the root canal. Irrigation of the root canal system permits removal of residual tissue needs proper irrigation techniques and material. The purpose of this study was to obtain data on the results of chemomechanical preparation of the smear layer in the apical third of the area is irrigated using two sonic irrigation techniques. Thirty permanent premolars were divided into three groups. Group E were using Endoactivator[®] techniques. Group V were using Vibringe[®], and K as the manual control group. Those three irrigation technique were examined using SEM in all groups . Débridement efficacies were analysed Kolmogorov – Smirnov and given results. There was no significant difference between groups E and V (p = 0.059). Both types of sonic irrigation techniques showed no statistically significant differences. Descriptively, Endoactivator[®] sonic irrigation techniques gives better result than Vibringe[®] and manual controls.