Title: Influence of cone-beam computed tomographic scan mode for detection of horizontal root fracture

Author: Costa, F. F and et al.

Journal: JOE, Volume 40, Number 9: 1472

Reviewer: Raj Shenoy, DDS

Purpose: This study tested the accuracy of small-volume CBCT imaging in detecting HRF's (Horizontal root fractures) in teeth with and without IMP (intracanal metallic post) and investigated the use of two different acquisition protocols of a CBCT device for diagnosing HRF's

Materials and Methods:

- Samples were prepared: 20 jaws, 40 single rooted premolars used and crowns sectioned at CEJ. Endodontic treatment completed, 2/3rds of GP removed, post molded within root canal. In 20 of the 40 teeth: root was fractured horizontally using a hammer. The teeth were then placed on a soft foundation. (20 teeth with fractures and 20 teeth without fractures)
- Image acquisition:
  - CBCT scan was performed for each tooth individually (1st protocol): the teeth were placed in empty mandibular sockets of 20 human dry mandibles with 1024 projections and another CBCT scan was taken with 512 projections (2nd protocol). All with small FOV
  - Chromium cobalt metallic posts were inserted into the root canals and teeth were scanned again with the same two protocols
  - 20 CBCT scans of roots with metallic post and an equal number of images without a metallic post. (Each group had 20 teeth with a fracture and 20 teeth with no fracture).
  - CBCT readers examined 80 samples

Results: In the samples with no intracanal metallic post, the most favorable results were found.

- Sensitivity: Without a metallic post --> 0.70-0.80 and with a metallic post --> 0.6-0.8
- Accuracy: Without a metallic post--> 85%-90% and with metallic post -->75%-90%

There was strong intraobserver agreement for the samples without metallic posts.

Conclusion: Different sizes and FOV may influence quality of CBCT scan and radiation dose. (Smaller volume scan = higher resolution images and this is important in detecting root fractures.) This study used small volume CBCT scans. The CBCT device in this study showed high accuracy, sensitivity and specificity in both protocols even in samples with intracanal metallic posts. The HI-HI protocol samples showed slightly higher sensitivity, specificity and accuracy values compared to HI-STD protocol. Using a small volume CBCT is better in diagnosing HRF compared to large volume CBCT.

LOE: 5
Title: *In vitro* comparison in a manikin model: Increasing apical enlargement with K3 and K3XF rotary instruments

Authors: Olivieri JG et al.

Reviewer: Hari P Chebrolu, DMD

Journal: JOE: Volume 40(9); 1463-67

Purpose: Mechanical preparation of curved root canals produces asymmetrical material removal, leading to apical transportation. Many studies have highlighted the correlation between the flexibility of nickel-titanium (NiTi) instruments and their influence on more centered preparations. This study evaluated how apical enlargement with 25/04, 30/04, 35/04, and 40/04 K3 and K3XF rotary files influences apical transportation, WL loss, and working time in mesial mandibular root canals in a manikin model.

Materials and Methods:

- Forty extracted first mandibular molars with two curved mesial root canals with separate foramina were selected
- Access was performed with round diamond burs and Endo-Z burs
- The WL was determined by subtracting 1 mm from where the tip of a size 10 K-file was visibly adjusted to the apical foramen under an operative microscope
- A customized jig was designed for each tooth in a buccolingual (BL) and a mesiodistal (MD) orientation to maintain a constant position
- A #15 K-file was placed in the root canal to the WL, and 3 preinstrumentation radiographs with different orientations were taken
- Each tooth was placed in the first mandibular molar position of a typodont fixed in silicone with the apical portion coated in wax. The typodont was then placed in an adult dental simulator manikin and isolated with a rubber dam and a #7 clamp
- A manual glide path up to a #20 K-file was performed before rotary instrumentation.
- Group A was prepared with K3 instruments and group B with K3XF instruments.
- Additionally, subgroups A1–A2 and B1–B2 were created based on the number of uses of the instrument
- Post-instrumentation radiographs were taken in both the BL and MD views after instrumentation with 25/04, 30/04, 35/04 and 40/04 rotary files with the corresponding NiTi K-File of the same size to the WL

Results: Results exhibited no significant difference in both WL loss and apical transportation when apical enlargement was performed to a #35–40 file in either groups. Although differences were observed when instrumentation was performed to a #35–40 file, the resulting apical transportation may not be clinically significant. It was concluded that apical enlargement can be performed safely up to a 35–40/04 file when needed with K3 and K3XF.

LOE: 5
Title: Blue treatment enhances cyclic fatigue resistance of vortex nickel-titanium rotary files

Author: Plotino G, et al

Journal: JOE Volume 40(9); 1451–1453

Reviewer: Youngsook Chae, DMD

Purpose: Vortex NiTi files: M-Wire NiTi alloy which is produced under specific tension and heat treatment at various temperature. Vortex Blue NiTi files: a new proprietary processing of NiTi wire which result in a distinctive blue color because of a titanium oxide layer. This study evaluated the difference in cyclic fatigue resistance between Vortex Blue (Dentsply Tulsa Dental, Tulsa, OK) and Profile Vortex nickel-titanium (Dentsply Tulsa Dental) rotary instruments.

Materials and Methods: Two groups of nickel-titanium endodontic instruments were used: ProFile Vortex and Vortex Blue. The tip size and taper tested were (15/.04, 20/.06, 25/.04, 25/.06, 30/.06, 35/.06, and 40/.04). Ten instruments from each system and size were tested for cyclic fatigue resistance, resulting in a total of 140 new instruments. All instruments were rotated in a simulated root canal with a 60° angle of curvature and a 5-mm radius of curvature of a specific cyclic fatigue testing device until fracture occurred. The number of cycles to failure and the length of the fractured tip were recorded for each instrument in each group. The mean values and standard deviation were calculated, and data were subjected to 1-way analysis of variance and a Bonferroni t test. Significance was set at the 95% confidence level.

Results: When comparing the same size of the two different instruments, a statistically significant difference ($P < .05$) was noted between all sizes of Vortex Blue and Profile Vortex instruments except for tip size 15 and .04 taper ($P = 1.000$). No statistically significant difference ($P > .05$) was noted among all groups tested in terms of fragment length.

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<tr>
<td>Profile Vortex</td>
<td>1542 (153)</td>
<td>643 (62)</td>
<td>902 (108)</td>
<td>536 (52)</td>
<td>305 (96)</td>
<td>296 (80)</td>
<td>471 (80)</td>
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<td>Vortex Blue</td>
<td>1705 (716)</td>
<td>1466 (101)</td>
<td>1562 (69)</td>
<td>1377 (133)</td>
<td>840 (165)</td>
<td>456 (33)</td>
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Conclusion: Vortex Blue showed a significant increase in cyclic fatigue resistance when compared with the same sizes of ProFile Vortex.

LOE: 5
Title: Shaping ability of Waveone primary reciprocating files and ProTaper system used in continuous and reciprocating motion.

Author: Giuliani V et al.


Purpose: This study compared the shaping effects of Wave One vs. ProTaper files reciprocating and conventional movements in a simulated canal.

Reviewer: Hao Tran, DMD

Materials and Methods: Seventy-five S-shaped canals in resin blocks were colored with ink injected with a syringe. Three groups were created:
- Group 1: WaveOne with reciprocating motion
- Group 2: ProTaper Universal with conventional movements
- Group 3: ProTaper Universal with reciprocating movements

Preoperative and postoperative photographs of the simulated canals were positioned under a stereomicroscope connected to a digital camera. LabView software was used to evaluate the following parameters:
- Mean axis of simulated canals before and after instrumentation
- Measuring the differences in apical and coronal curvature modifications
- Measuring the amount of resin removed for both curvatures on the right and left sides of the simulated canals
- Differences in canal curvature modifications and in the amount of resin removed

Results: Apical circumference, radius of curvature of the simulated canals shaped with ProTaper Universal instruments in reciprocating motions (Group 3) showed significant differences with respect to the other 2 groups, Wave One and ProTaper Universal in continuous motion. There were no differences in the coronal curvatures among the 3 experimental groups. Total amount of resin removed at both sides of the simulated canals was not significantly different in the 3 groups

Conclusion: ProTaper Universal NiTi files in continuous motion (Group 2) removed a significantly greater amount of resin compared with Group 1 and 3. Group 3 with no statistically significant changes in the radius of apical curvature before and after shaping the simulated canals. In both groups 1 and 2, the radius of the coronal and apical curvature changed significantly before and after instrumentation, resulting in a straightening of the canal.

LOE: 5
Title: Impact of heat treatments on the fatigue resistance of different rotary nickel-titanium instruments

Authors: Braga L et al.

Journal: JOE, Vol 40, No( 9);1494

Reviewer: Hari Priya Chebrolu, DMD

Purpose: Rotary instruments made of nickel-titanium (NiTi) alloys are commonly used in endodontic treatments to facilitate the shaping of root canals that exhibit complex anatomies. Increasing resistance to instrument fracture has been a focus in the advancement of rotary NiTi instrument technology. Two new recent advancements are the Mwire and CM (Controlled memory) technologies, in which endodontic instruments are subjected to a special thermal process after being machined from conventional NiTi wire to increase their fatigue resistance. The aim of this study was to assess fatigue resistance of rotary nickel-titanium (NiTi) files by comparing files made using these two technologies with conventional NiTi files.

Materials and Methods: Files with a similar cross-sectional design and diameter were chosen for the study: new 30/.06 files of the EndoWave (EW), HyFlex (HF), ProFile Vortex, and Typhoon systems(TYP) together with ProTaper Universal F2 instruments. EW and HF exhibit triangular cross-sections, whereas PTU F2, PV, and TYP exhibit convex triangular cross-sections. These instruments however use different technologies: EW and F2 are made of C-NiTi, PV is made with MW, and HF and TYP are CM files. The compositions and transformation temperatures of the instruments were analyzed using x-ray energy-dispersive spectroscopy and differential scanning calorimetry. The average number of cycles to failure was determined using a fatigue test device.

Results: All of the instruments exhibited the same chemical composition, namely, 51% Ni–49% Ti. High amounts of oxygen were initially found on the HF and TYP files because of their thick oxide surface layers. When this layer was properly ground and the analysis was repeated, the average values of Ni and Ti were the same as those of the other instruments. The average number of cycles to failure values were higher for the TYP files compared with the PV files and even higher for the HF files compared with the EW files. Fatigue resistance of the files tested in this study CM technology > MW > C-NiTi.

Conclusion: Both MWire (MW) and controlled memory (CM) technologies increase the fatigue resistance of rotary NiTi files.

LOE: 4
Title: Effects of Protaper Universal, Protaper Next, and Hyflex instruments on crack formation in dentin.

Author: Capar I et al.

Journal: JOE- 40(9): 1482-1484

Reviewed by: Saehee Kim, DMD

Purpose: This study determined the incidence of cracks in root dentin after root canal preparation with Protaper Next and Hyflex compared with the Protaper Universal.

Material and Methods:

- 100 non defective / non-cracked Extracted mandibular premolars with root canal curvature less than 10 degree used in this study.
- Of the 100 Teeth: 25 teeth left unprepared as negative control group while 75 teeth assigned to 1 of 3 root canal shaping groups. For group 1, 2 and 3, the apical preparation was completed with size 40 after glide path with up to size 15 K-file
  - Group 1 (positive control): Protaper universal file in the sequence of SX, S1, S2, F1, F2 and F3 at 250 rpm
  - Group 2: Protaper Next files in the sequence of SX, X1, X2, X3 and X4 at 300rpm and 200 g/cm torque
  - Group 3: Hyflex files used in the sequence of 25/.08, 25/.06, 30/.06 and 40/.04 at 500 rpm and 250 g/cm torque
- All roots sectioned perpendicular to long axis at 2, 4, 6, and 8 mm from apex. Then 100 slices were blindly examined for cracks in each group.

Results: The Protaper Next and HyFlex instruments caused fewer cracks (28% each) than the ProTaper (56%) Universal instruments (statistically significant). However, no significant differences in crack formation between Protaper Next and HyFlex group. No vertical root fractures in any group.

Conclusion: All three instruments (Protaper, Protaper Next, and Hyflex) causes crack but Protaper Next and Hyflex instruments cause fewer than Protaper Universal.

LOE: 5
Title: Differences in cyclic fatigue resistance between ProTaper Next and ProTaper Universal Instruments at Different Levels

Author: Perez-Higueras J et al.

Journal: JOE, Volume 40(9); 1477

Reviewer: Nadia Liss, DMD

Purpose: New designs and alloys have been developed to increase cyclic fatigue (CF) resistance of rotary files. The aim of this study was to compare CF resistance of ProTaper Universal (PTU; Dentsply Tulsa Dental, Tulsa, OK) and ProTaper Next (PTN, Dentsply Tulsa Dental) instruments at different points of curvature.

Materials & Methods:
- total of 420 files: 240 (PTU-S1, F1, F2, and F3) and 180 (PTN-X1, X2, and X3)
- divided in 14 groups of 30 instruments each
- groups S1–5, F1–5, X1–5, F2–5, X2–5, F3–5, and X3–5 tested at 5 mm from the tip
- groups S1–12, X1–12, and F1–12 tested at 12 mm from the tip because S1, X1, and F1 instruments have the same diameter at that level
- groups F2–8, X2–8, F3–8, and X3–8 were tested at 8 mm (F2/X2 and F3/X3, respectively, had the same diameter at 8 mm)
- all files were rotated at 300 rpm until fracture
- CF resistance was tested in stainless steel curved canals (60°, r = 3 mm). Time to fracture recorded
- data statistically analyzed

Results: PTN instruments will last significantly longer than PTU files with a probability higher than 98% at all tested levels except for S1, which was the significantly the most resistant instrument to CF at 5 mm from the tip. Although S1 had a 11.3% longer lifespan than X1 and 83% more than F1 on average at 5 mm from the tip, when compared at a level with the same diameter (12 mm from the tip), X1 resisted 46% more time than F1 and 50% more than S1. In fact, S1–5 showed the highest h value, whereas S1–12 showed the lowest. For PTU instruments, S1 was the most resistant, F1 was significantly more resistant to cyclic fatigue than F2, and F2 was more resistant than F3. For PTN files, X1 was significantly more resistant to cyclic fatigue than X2, and X2 was more resistant than X3

Conclusion: PTU S1- significantly the most resistant instrument at 5 mm from the tip. PTN files- significantly more resistant to CF than PTU instruments at all other tested levels.

LOE:5
Title: Biocompatibility evaluation of Biodentine in subcutaneous tissue of rats

Author: Mori G et al

Journal: Journal of Endodontics Vol 40 (9):1482

Reviewer: Christina Lee, DDS

Purpose: Biodentine is a new material. It is a tricalcium silicate cement developed based on the composition of mineral trioxide aggregate (MTA) with the attempt to improve on the physicochemical and biological properties. This study evaluated the biocompatibility of Biodentine in the subcutaneous tissue of rats

Materials and Methods:

- 15 male rats
- 60 sterile polyethylene tubes divided into 4 groups
  - empty tubes (negative control)
  - tubes with zinc oxide and eugenol (positive control)
  - MTA
  - Biodentine
- Each rat had 4 tubes implanted (one from each group)
- 5 rats were killed after 7, 14, and 30 days
- 12 sections per specimen were obtained and analyzed by light microscopy

Results: Histologic sections of tissues containing:

- empty polyethylene tubes showed non-significant or mild inflammatory process
- zinc oxide eugenol tubes had moderate to severe inflammatory process
- MTA had mild or non-significant inflammation
- Biodentine had moderate to severe inflammation after 7 days but at 14 and 30 days specimens showed a reduction in the inflammatory process

Conclusion: Biodentine was compatible with tissue after 2 weeks.

LOE: 5
Managing endodontic patients with severe gag reflex by glossopharyngeal nerve block technique

November 19

Title: Managing endodontic patients with severe gag reflex by glossopharyngeal nerve block technique

Author: Garg R et al.

Journal: JOE, Volume 40, Number 9; (1498-1500)

Reviewer: Christopher Maguire-Adams, DMD

Purpose: Gagging is a protective reflex, but when the gag reflex becomes abnormally active, it poses a difficulty for the dentist because it hinders all aspects of dental procedures including diagnosis, radiography, and any form of active procedure. This study assessed the glossopharyngeal nerve block technique to decrease the gag reflex.

Materials and Methods: The case involved a 38 year old woman with an exaggerated gag reflex classified as Type IV. To overcome this difficulty the authors used a glossopharyngeal nerve block technique that is used by anesthetists and otolaryngologists, but its endodontic use has gone previously unreported. The Dickinson and Fiske Gagging Severity Scale was used:

- Grade I (Normal Gagging Reflex): Occasional gagging during high-risk dental procedures such as maxillary impression taking or restoration to the distal, palatal, or lingual surfaces of molars.
- Grade II (Mild Gagging Reflex): Gagging occurs occasionally during routine dental procedures such as fillings, scaling, and impressions.
- Grade III (Moderate Gagging): Gagging occurs routinely during normal dental procedures.
- Grade IV (Severe Gagging): Gagging occurs with all forms of dental treatment including simple visual examination.
- Grade V (Very Severe Gagging): Gagging occurs easily and may not necessarily require physical intervention to trigger the reflex.

Result: The response to gag reflex decreases after successful glossopharyngeal nerve block.

Conclusions: The glossopharyngeal nerve block technique is a relatively safe, simple, and easy to master technique as compared with general anesthesia for treating a patient with an exaggerated gag reflex. The glossopharyngeal nerve block technique may be used in dental procedures in patients with an exaggerated gag reflex or when performing procedures in the posterior aspect of the mouth. Due caution should be exercised to prevent inadvertent intravascular administration of local anesthetic when using this procedure.

LOE: 5
Frequency of BRONJ is 1-10%
BRONJ with oral administration is less common
Majority of cases reported in patients with osteoporosis or RA
No strong evidence that links RA to BRONJ
Drugs prescribed for patients with RA including steroids, methotrexate contributes to BRONJ.
The patient had stopped taking BP for almost 1 year and healing was uneventful until she started taking methotrexate.
BRONJ develops after invasive dental procedures
Management of current case: CHX mouth rinse and a broad spectrum antibiotic (amoxicillin)

Conclusion: Methotrexate seemed to tip the scale from a slow healing surgical site to one of BRONJ. All patients should have thorough oral exam before starting to take BP

LOE: 5
The use of cone-beam computed tomography in the preservation of pulp vitality in a maxillary canine with type 3 dens invaginatus and an associated periradicular lesion

Author: Teixido M et al.

Journal: JOE, Volume 40, Number 9; 1501-05

Reviewer: Hao Tran, DMD

Purpose: Dens invaginatus is a developmental anomaly caused by an invagination in the surface of the tooth crown that occurs before calcification. The prevalence of dens invaginatus in teeth is between 0.3% and 10. The most commonly affected tooth is the maxillary lateral incisor followed by the maxillary central incisor. Dens invaginatus is classified into three types:

- Invaginations remain confined to the crown
- Invaginations extend into the root, ending as a blind sac.
- Invaginations extend into the root and exit apically or laterally with no communication with the pulp, but any infection within the invagination can lead to an inflammatory response within the periodontal tissues, giving rise to peri-invagination periodontitis

This is a case report to demonstrate the use of CBCT in the treatment of Dens Invaginatus.

Materials and Methods: A 13-year-old female patient reported episodes of pain and swelling associated with tooth #6 over the previous 3 weeks. Her tooth had an enlarged crown with a small pit evident in the mesial portion of the palatal surface. There was no evidence of caries. Radiographic examination revealed that the tooth had a small periradicular radiolucency and signs of a type 3 invagination (Oehlers’ classification), which appeared to have its own apical foramen.

- File: 70/.12 GT Series
- 4.2% sodium hypochlorite, dried with paper cones, and dressed with a calcium hydroxide paste
- Final Flush with 4.2% sodium hypochlorite and 17% EDTA
- Prepared invagination was filled entirely with white mineral trioxide aggregate (ProRoot MTA)
- A wet cotton pellet was placed over the MTA, and the remainder of the access cavity was filled with IRM cement.
- The patient returned 3 days later to have the access permanently filled with a light-cured composite resin

Results: The pulp surrounding the invagination was not adversely affected by the infected dens and remained vital. The reconstructed CBCT images showed no apparent communication between the root canal space and the invagination

LOE: 5
Title: Comparing the in vivo diagnostic accuracy of digital periapical radiography with cone-beam computed tomography for the detection of vertical root fracture

Authors: Chavda R et al.

Journal: JOE, Volume 40, Number 10;1524-29

Reviewer: Hari P Chebrolu, DMD

Purpose: Complete or incomplete vertical root fracture (VRF) develops longitudinally along the root and is difficult to diagnose. The diagnostic yield of conventional digital radiography (DR) is limited by its 2-dimensional nature. Cone-beam computed tomography (CBCT) imaging enables the clinician to view the tooth from multiple planes and different angles, which may overcome the limitations of DR. Previous ex vivo studies have shown that CBCT imaging is superior to DR for the detection of artificially created VRFs. However, ex vivo studies do not account for patient factors such as the effect of surrounding tissues or the possibility of motion artifacts during scanning. The purpose of this in vivo study was to determine whether there is a difference in the diagnostic accuracy of DR and CBCT imaging in the detection of VRF. Visual inspection of the root surface in order to confirm the presence/absence of VRF was the reference standard against which both imaging modalities.

Materials and Methods: Twenty-two teeth from 21 patients were included in the sample. Each tooth had been deemed unsalvageable after a thorough clinical examination by an experienced endodontist. Radiographic technique: Digital radiographs were taken using a charge-coupled device sensor (Schick Technologies, New York, NY) and a standard dental x-ray unit. CBCT scans were taken using a small-volume (40 mm3) CBCT scanner (3D AccuitomoF170; J Morita, Kyoto, Japan). Optical coherence tomographic (OCT) imaging was used to measure the width of fracture in order to assess whether fracture size impacts on the diagnostic accuracy of either imaging modality. Each tooth was atraumatically extracted in order to minimize possible intraoperative fracture creation. Each root surface was cleaned with a toothbrush and then visually inspected under a dental operating microscope at 12.0 magnification to confirm the presence or absence of root fractures. A fracture was deemed to be present if there was separation of the root fragment or a dark line traversing along the root surface.

Results: Thirteen examiners were recruited to assess the radiographs and CBCT scans. The examiners were asked to record the presence/absence of a VRF using a 5-point confidence scale as follows:

- 1: VRF definitely not present
- 2: VRF probably not present
- 3: unsure
- 4: VRF probably present
- 5: VRF definitely present.

The results indicate that both DR and CBCT imaging have comparably poor sensitivity (0.16 and 0.27, respectively) and comparably high specificity (0.91 and 0.83, respectively), meaning, that both modalities can reliably detect a tooth that is not fractured.

Conclusion: Both DR and CBCT imaging have significant limitations when detecting vertical root fractures in vivo. CBCT imaging could be a useful adjunct to a thorough clinical examination, albeit more likely through the earlier detection of subtle changes in periradicular bone rather than specifically detecting the fracture line.

LOE: 4
Title: Cell attachment properties of portland cement-based endodontic materials: biological and methodological considerations

Author: Ahmed H et al.


Reviewer: Christina Lee, DDS

Purpose: One criterion for the evaluation of biological properties of dental materials is cell attachment onto the material since cell adhesion is necessary before cells can proliferate, differentiate, and produce an extracellular matrix. Scanning electron microscopy is a method used to observe material-cell interactions. This review discusses the cell attachment properties of commercial and experimental PC-based materials on different cell cultures by using scanning electron microscopy (SEM). Methodological aspects and technical challenges are discussed as well.

Materials and Methods: A PubMed electronic search was conducted for articles from January 1993 to October 2013, using appropriate keywords to identify the available investigations on the cell attachment properties of PC-based endodontic materials.

Results: Twenty-three articles were found. This review summarizes the cell attachment properties of commercial and experimental portland cement-based materials on different cell cultures using SEM. The most common sample preparations were on coverslips or disks embedded in well plates. The disadvantage is that samples could be lost because coverslips may not withstand dehydration, drying and metal coating required for SEM. Processing challenges are: reaction between the portland cement-based material and reagents used during processing which complicates the SEM interpretation of cell morphology. The SEM cannot detect dead cells because they detach and become washed during processing. The method for evaluation was SEM images are interpreted for adhesion and spreading of cells. The disadvantage of SEM was slight or moderate differences between cytotoxic profiles of different biomaterials which usually cannot be detected by SEM. The relevance of SEM in determining biological profile of portland cement-based materials showed SEM provided qualitative analysis, is relevant but should be combined with other assays to obtain an accurate biological profile.

Conclusions: SEM observations demonstrate that commercial portland cement-based formulations show favorable cell attachment properties. SEM provides useful information on the cell attachment properties of portland cement-based materials, however other assays for cell proliferation and viability are needed to obtain an accurate in vitro biological profile.

LOE: 3
Title: Effects of a triple antibiotic solution on pulpal dynamics after intentionally delayed tooth replantation in mice

Journal: JOE Vol. 40(10); 1566-1572

Author: Quispe-Salcedo A et. al

Reviewer: Jeffrey Yui, DDS

Purpose: This study detailed the biological events underlying pulpal dynamics evoked by 3Mix (a mixture of ciprofloxacin, metronidazole, and minocycline) solution after intentionally delayed tooth replantation.

Materials and Methods: Maxillary first molars of 100, 3-week old mice were extracted and immersed in either 3Mix for 30 minutes or phosphate buffered saline (PBS). The teeth were then repositioned in their original socket after immersion. Immunohistochemistry, apoptosis assay, and reverse-transcriptase polymerase chain reaction were utilized to assess cell proliferation, apoptosis, and differentiation. Statistical analysis used after cell counting to compare cell numbers between groups.

Results: Active cell proliferation was observed in 3Mix solution:

- odontoblast differentiation in the coronal pulp on day 7 and tertiary dentin formation on day 14
- regenerative process was delayed in the PBS group.

Cell proliferation and apoptosis occurred in the pulp of the 3Mix group during days 5-7 and subsequently decreased from days 7-14. Expression of nestin (marker for odontoblast differentiation) and dentin sialophosphoprotein (DSPP) observed on day 5 in the 3Mix group, whereas expression levels alkaline phosphatase, osteopontin, and osteocalcin (all bone-related markers) increased in the PBS group. The expression levels for octamer-binding factor 3/4A and 3/4B (regulator in maintaining self-renewal properties) reached the maximum level on day 1 and were sharply decreased on day 3 in both groups. High expression levels of Cd11c (marker for dendritic cells) were first observed in the 3Mix group on day 1 and later at days 5 and 7

Conclusion: The results suggest that the application of 3Mix may suppress osteoblast differentiation by the migration of dendritic cells to the injury, resulting in the acceleration of odontoblast-like cell differentiation

LOE: 5
Title: Radiographic identification of separated instruments retained in the apical third of root canal–filled teeth

Author: Rosen E et al.

Journal: JOE, Volume 40, Number 10; 1549-1552

Reviewer: Youngsook Chae, DMD

Purpose: During case selection and treatment planning of root canal–treated teeth with apical periodontitis, it is essential to evaluate the ability to effective disinfection of the root canal system and the prevention of recontamination. Preoperative detection of retained separated instruments located at the canal’s apical third is crucial because there might be limited expected success rate and possible complications. Management alternatives for Separated instruments: 1) Leaving the separated instrument in the canal while endodontically treating and sealing the more coronal parts of the canal. 2) Bypassing the instrument and incorporating it into the root filling material. 3) Retrieving the instrument. 4) Retrograde endodontic surgery. The aim of the study was to compare the diagnostic ability to radiographically detect separated stainless steel (SS) versus nickel-titanium (NiTi) instruments located at the apical third of filled root canals with either AH 26 or Roth sealer.

Materials and Methods: Sixty single-rooted extracted human teeth with one straight root canal were instrumented to a size 25 apical diameter. Three groups were formed:

• 20 teeth with fractured apical 2-mm segments of #30 SS files
• 20 teeth with fractured apical 2-mm segments of #30 NiTi files
• 20 teeth without fractured files

Subsequently, the root canals were filled using laterally condensed gutta-percha and either AH 26 sealer (AH) or Roth sealer (Roth). All teeth were radiographed using conventional Kodak film (Eastman Kodak Co, Rochester, NY) and a charge-coupled device digital sensor. The evaluation of the images for the presence of a fractured instrument was performed independently by two blinded observers. The data were statistically analyzed using McNemar and Fisher exact tests.

Results: In total 82.2% of the separated instruments were identified by the observers. There were no significant differences in the diagnostic ability between digital and conventional radiography or the different root canal sealers (AH vs. Roth, \( P > .05 \)). The sensitivity to detect fractured SS was significantly higher than NiTi (\( P < .05 \)).

Conclusion: It may be difficult to radiographically detect a retained separated instrument. It is easier to radiographically detect fractured SS than NiTi instruments retained at the apical third of the root canal.

LOE: 5