Title: A comparative study of physiochemical properties of AH Plus®, Epiphany® and Epiphany SE root canal sealers

Author: Resende L et al


Reviewer: Sheerin Yusuf, DMD

Purpose: To assess the physiochemical properties of AH Plus®, Epiphany® and Epiphany® SE root canal sealers.

Materials and Methods: Setting time, flow, radiopacity, solubility and dimensional changes after setting for AH Plus® (group I), Epiphany® (group II), Epiphany® plus thinning resin (group III) and Epiphany® SE (group IV) root canal sealers were measured according to ANSI/ADA (2000) standards for root canal sealer materials. Analysis was performed by a single examiner who was blind to the materials identification. All materials were manipulated according to manufacturer’s instructions. To standardize and homogenize the amount of material, 0.3 g of sealer was dispensed onto the mixing pad and spatulated for 15s for each sample. Groups II, III and IV were mixed and handled in darkroom using low wattage red safelight bulb (15 W) as they are dual cure resins. For physiochemical tests, the arithmetic mean of 5 replicates for each sealer was recorded and considered as the result of the test.

Results and Discussion:

- Setting time: The ANSI/ADA requires that the setting time of a sealer shall be within 10% of that stated by the manufacturers. AH Plus® and Epiphany® have a stated setting time of 8h (480 min) and 25 min of setting time, respectively. The mean values were in agreement with the ANSI/ADA standards. Setting time of AH Plus® was significantly higher than other groups.
- Radiopacity Test: All materials demonstrated radiopacity above 3mm of aluminum recommended by ANSI/ADA specification 57. Statistical analysis demonstrated similar radiopacity among AH Plus® and Epiphany® SE, which was higher than other groups.
- Flow Test: The ANSI/ADA (2000) requires that a sealer shall have a diameter of no less than 20mm and all groups conformed to the standards. Epiphany® and Epiphany® plus thinner have higher values compare to other groups.
- Solubility: A root canal sealer should not exceed 3% by mass when the solubility of the set material is tested (ANSI/ADA 2000). Solubility results of AH Plus®, Epiphany® plus thinner and Epiphany® SE were within ANSI/ADA standards. Epiphany® did not conform to ANSI/ADA (2000) in absolute values; however, the lower limit of the range of the values was within the recommendations.
- Dimensional change: Neither sealer conformed to the ADA/ANSI standardization, which states that the mean shrinkage of sealer should not exceed 1% or 0.1% in expansion. AH Plus® and Epiphany® plus thinner have lower dimensional change compare to others.
- SEM examination: Scanning electron microscopy revealed presence of sphere and plate shaped polymers of different sizes. Non-homogenous in AH Plus® and Epiphany® and compact uniform in Epiphany® plus thinning and Epiphany® SE.

Conclusions: Overall setting time, flow, and radiopacity tests of AH Plus® Epiphany®, Epiphany® plus thinner, Epiphany® SE conformed to ANSI/ADA standards. The dimensional change in all four groups and solubility of Epiphany® were greater than values considered acceptable. SEM revealed that Epiphany® SE had more organized, compact and homogenous polymers in a reduced resin matrix than AH Plus® and Epiphany®.

LOE: 5
Purpose: To provide a review that describes a practical criteria and systematic process, that can aid in the treatment planning decision of whether to preserve teeth by root canal treatment or extract and provide an implant.

Materials and Methods: Review of current evidence based literature (1966- July 2008) and expert views of specialists in endodontics, restorative, and implantology were used to form the author’s conclusion. A MEDLINE and hand search was conducted to select articles. They searched MEDLINE with different keywords (root canal therapy, dental implants, decision making, treatment planning, outcome, and human), then made a final hand selection of articles based on the articles being published in English, overall relevancy with RCT and implants, and articles that are not a single case report. After the search was completed 49 articles were reviewed.

Results and Discussion: When deciding to provide root canal treatment, retreatment, or tooth replacement by implant, the following criteria should be evaluated: local/site specific characteristics, overall oral situation, and patient-related factors should be considered. (Fig 2, 3, and 4 Table 3).
Figure 3 Local factors influencing the predictability of treatment outcomes.

Figure 4 Reconstructive aspects in treatment planning.
- local/site specific characteristics - Endodontic and periodontal status, remaining tooth structure, restorability with core build-ups, existing post and core, previous restoration, strategic value of the tooth within the dentition
- oral situation - condition of adjacent and remaining dentition and oral tissues involved in proposed treatment plan
- patient-related factors - patient expectations, medical contraindications, time, money

Once the criteria are evaluated, the most successful evidence-based treatment should be treatment planned. Overall, root canal treatment, retreatment, and implants provide successful outcomes when completed under favorable above stated criteria. Dentists need to carefully scrutinize and evaluate the methodology and proposed dental outcomes in published dental (Table 2). Practicing dentists need to be made aware of previous and emerging research terminology related to RCT and implants, and how it is related to research outcomes (Fig 1).
survival, success, failure, healed, healing/success, and diseased/survival.

Conclusions: To determine if a dentist should preserve a tooth by root canal treatment or extract and provide an implant requires individual treatment plans to follow a comprehensive decision-making process, which includes local/site tooth specific characteristics, an overall oral evaluation, and patient-related factors (Fig 2). A simple comparison of unique literature outcomes cannot fulfill the needs of every patient. Each patient needs to be evaluated on a case by case situation.

LOE: 4

Title: The nociceptive and anti-nociceptive effect of white mineral trioxide aggregate.

Author: Abbasipour F et al

Journal: IEJ vol 42(9): 1365

Reviewed by: Aneel Belani, DDS

Purpose: To investigate the nociceptive and anti-nociceptive effects of white MTA on an experimental orofacial pain model in rats.

Materials & Methods: Seventy-eight male Spague-Dawley rats were subjected to test substances. In part 1, 30 rats split into three groups received 40uL of either 2.5% formalin, white MTA (in 5, 10, 20 mg concentrations), or eugenol in upper lip. Eight were given saline control. In part 2, 20 rats split into two groups were given local injection of white MTA or eugenol followed by 2.5% formalin 15 minutes later into the upper lip. In all experiments, the rats were placed in a transparent box for 45 minutes and time rubbing of the injected area was measured in seconds recorded in five minute intervals. Response was scored as either 0 (normal behavior), 1 (abnormal head movement), 2 (abnormal continuous jaw shaking), or 3 (excessive mouth rubbing). Data was put through statistical analysis.

Results: Part 1: formalin in the upper lip caused immediate response at 5-10 min and tonic response at 15 min. No pain behavior noted with any WMTA dose. Part 2: Nociceptive response to formalin was reduced significantly by prior WMTA treatment. Eugenol significantly reduced nociceptive response it did not completely reduce nociceptive response. So, WMTA could reduce both responses whereas eugenol was more effective in reducing initial pain.

Conclusion: This study shows that WMTA has an anti-nociceptive action. The reason for this effect may be due to the fact that MTA causes calcium release which can activate calcium dependant potassium channels resulting in neuron hyperpolarization. WMTA alone does not induce any pain behavior whereas eugenol can and WMTA is more effective against dental pain than eugenol. Because WMTA reduces early and late pain response it may be an effective agent in reducing postoperative pain.

LOE: 5
Title: Australian endodontists’ perceptions of single and multiple visit root canal treatment

Author: Sathorn et al


Reviewer: Jay Gupana DMD

Purpose: To ascertain endodontists’ point of view (treatment philosophy, rationale and preference) regarding single- and multiple-visit root canal treatment. To identify the basis on which the choice is made and how the information necessary for the choice is acquired.

Materials and Methods: All registered Australian endodontists were contacted. Those who agreed to participate in the study were interviewed in person or by telephone. A 15-20 min interview was conducted addressing demographics, current clinical procedures, treatment rationales, and preference. A hypothetical scenario was posed to investigate which treatment regimen (single or multiple visit RCT) they would prefer to deliver if biological concerns were eliminated from consideration.

Results and Discussion:

- 52 endodontists (71% of all Australian endodontists) agreed to participate
- 51/52 participants had performed single visit RCT but few routinely performed it.
- A majority of participants were willing to provide single appointment RCTs where patients had time constraints and in vital cases.
- If all biological constraints were set aside (that complete disinfection could be achieved in a single visit) only 25% of participants would continue to prefer multiple visit endodontics.
- Major concerns of participants who preferred multiple visit endodontics was bacterial control and management of infected canals
- Many interviewees felt strongly that bacterial control could be maximized only with calcium hydroxide.
- The common mentioned fear of single visit endo is fear of flare-up
- Australian endodontists prefer multiple visit over single visit RCT even in cases where biological concerns are not an issue.
- Operator preference rather than biological or patient considerations appear to be the primary determinant of performing single or multiple visit therapy.
- The author found that bacterial culture studies are the gold standard by which the participants base their clinical decisions.
- The author feels that culture studies are not a good basis to judge clinical outcomes and should be replaced with healing rate studies.
- The author states that there is a lack of data on single vs multiple visit therapy in current studies.

LOE: 5
Title: Accuracy of periapical radiography and cone-beam computed tomography scans in diagnosing apical periodontitis using histopathological findings as gold standard

Author: Francisco Wanderly and et al.


Reviewer: Michael Sha, DMD

Purpose: To evaluate the sensitivity, specificity, and predictive values of Periapical Radiography (PR) and Cone-Beam Computed Tomography (CBCT) scan methods in diagnosing Apical Periodontitis (AP) using histopathological findings as a gold standard.

Materials and Methods: Ninety-six roots of dog teeth are divided into 4 groups (n=24)

- Grp 1: RCT in healthy teeth
- Grp 2: 1-visit RCT in infected teeth
- Grp 3: 2-visit RCT in infected teeth
- Grp 4: Untreated infected teeth

The radiolucent area in PRs and the volume of CBCT-scanned periapical lesions were measured before and 6 months after treatment. Eighty-three roots were examined histologically (13 roots lost during histo preparation). Additional 24 roots with healthy periapices were used as controls (Grp 5). True-positives (TPs), false-positives, true-negatives (TNs), false-negatives, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy (TP+TN) were calculated for PR and CBCT. The histo findings were used as gold standard.

Results:

- PR detected AP in 71% of roots. CBCT detected AP in 84% of roots. Histo findings diagnosed AP in 93% of roots.
- CBCT has a higher accuracy (0.92) than PR (0.78) in diagnosing AP.
- Grp 4 has the highest number of inflammatory cells, and Grp 5 has the lowest. Between Grp 1, 2, and 3 there is no significant difference.

Discussion/Conclusion:

- The NPV for PR diagnosis was 0.25. This means when an intact periradicular region was diagnosed by PR, 75% of the cases actually had PR.
- The value of PR is limited for diagnosing the absence of AP.
- The NPV for CBCT was almost twice as high as that for PR. Therefore, CBCT scan is more accurate in diagnosing healthy periapex.

LOE: 5
Title: An *in vitro* comparison of new irrigation and agitation techniques to ultrasonic agitation in removing bacteria from a simulated root canal

Author: Townsend C et al


Reviewed by: Andrew Cho, DMD

Purpose: To determine whether needle irrigation, EndoVac irrigation, EndoActivator®, F®-File and sonic agitation are as effective as ultrasonic agitation at mechanically removing bacteria in a simulated 30°C canal

Materials and Methods:

- 42 sterile plastic resin blocks with 30°C simulated root canals filed to 35/.06 in the apical third.
- 6 control blocks were filled with sterile brain-heart infusion (BHI) broth
- 36 remaining blocks were filled with BHI broth inoculated with *Enterococcus faecalis*
- All blocks were incubated aerobically at 37°C for 7 days.
- The various systems of agitation, irrigation, or ultrasonic were applied to the inoculated resin blocks 6 times (described on pg. 1041)
- After treatment, 0.1% crystal violet was placed in canals to stain remaining bacteria
- Na-deoxycholate detergent was then used to extract the remaining crystal violet from attached bacteria and placed in a microcentrifuge tube
- The Na-deoxycholate/crystal violet solution was analyzed using spectrophotometer, which measures bacterial quantity.
- Experiment was completed 3 times

Results:

- Ultrasonic agitation was not significantly different from the control
- No significant difference between the ultrasonic agitation and the use of EndoActivator®, F®-File, and sonic agitation.
- Ultrasonic agitation was significantly more effective at removing bacteria than needle irrigation and EndoVac irrigation.

Conclusion:

- This study suggests that the EndoActivator®, F®-File, and sonic agitation was just as effective as the ultrasonic agitation, this study was conducted on plastic blocks and not real teeth.
- Plastic canals do not have rough surface with irregularities and dentinal tubules like real dentin and the *E. Faecalis* may not have attached and formed biofilms on the walls of the plastic canals as it may on dentinal surfaces.
- This study did not address the effectiveness of agitation on difficult to reach areas of the root canals.
- Ultimately the results of this *in vitro* study found that none of the irrigation or agitation techniques eliminated all intracanal bacteria.

LOE: 5
Title: Negotiation of c-shaped canal systems in mandibular second molars

Author: Fan, B et al


Reviewer: Sorin Purtuc, DMD

Purpose: To investigate the method of canal negotiation in c-shaped mandibular 2nd molars using Micro-CT.

Materials and Methods: Forty-four extracted human teeth were used – all were mand. 2nd molars with fused roots and longitudinal radicular grooves. Teeth were stored in 10% buffered formalin after extraction. Pulp chambers were unroofed using fissure and Endo-Z burs. Five percent NaOCl was then placed in chambers for 2 hours. A surgical operating microscope was used to classify the chamber floor according to Min’s method.

- Type 1: peninsula floor with continuous c-shaped orifice.
- Type 2: peninsula floor separated by a buccal dentin strip, with M, D orifices that are oval, flat, or round.
- Type 3: mesial strip of dentin that separates the peninsula floor; there is a small ML (round, oval, or flat) orifice, and a MBD elongated c-shaped orifice
- Type 4: Non- c-shaped floor with a D orifice, and either one oval M or 2 round M orifices.

Number 10 or 15 k-files were used under the microscope to explore and find canals; files were inserted until the ends could be seen exiting through the apices. Then files were fixed in place with resin and teeth were scanned with the microCT. Three dimensional reconstructions were used to assess the canals for missed canals, missed apical canals, and minimum dentin thickness between initial file and outer wall.

Results:

- Type 1 configuration: 8/44 teeth (18%).
- Type 2: 16/44 (36%).
- Type 3: 14/44 (32%).
- Type 4: 6/44 (14%).

Out of 117 canals located 2mm above apex in the 44 teeth, 8 canals were missed (6.83%). Seven out of those 8 were a branch, a bifurcation, or multifurcation. Sixteen teeth (36.36%) had a canal bifurcation occurring within the apical 2 mm in which a missed apical canal was found in 14 of these (90%). In the coronal 1/3, minimal dentinal thickness was significantly larger in type 4. Type 3 had minimal dentinal thickness smaller than the other types (but non-significantly), at all root levels.

Discussion: Presence of anastomoses, isthmuses, lateral canals, and apical deltas in c-shaped canals makes cleaning, shaping, and sealing the canals more difficult. Careful exploration with small pre-bend k-files will allow finding more hidden canals. A different cleaning method employing less mechanical instrumentation, and more use of ultrasonic and chemical debridement should be used to achieve a more complete cleaning.

LOE: 5
Title: Bacterial and dye penetration through interim restorations used during endodontic treatment of molar teeth

Author: Chailertvanitkul et al.


Reviewer: Felicitas Wibowo, DMD

Purpose: To investigate the association between dye penetration and bacterial penetration simultaneously through interim restorations used during endodontic treatment of molar teeth when restored with Ketac™ Silver alone or Ketac™ Silver with stainless steel band reinforcement and while under simulated masticatory load.

Materials and Methods:

- 64 extracted human permanent molar teeth (32 Max teeth and 32 Mand teeth) were used.
- All teeth were accessed with MOD cavity preparation.
- Palatal cusps of Max. molar and buccal cusps of Mand. molar were removed to within 1 mm of CEJ. Canals were instrumented until a size 15 file reached the apical foramen and then irrigated with 1% NaOCl and 15% EDTA. Cotton pellet was placed over the orifices and covered with Cavit™.
- Experimental groups: 30 teeth were restored with Ketac™ Silver (KS group) and 30 teeth with Ketac™ Silver reinforced with stainless steel orthodontic band (KSSB group).
- Positive control: 2 teeth - Cotton was placed on the floor of pulp chamber and access cavities were left open without any restoration.
- Negative control: 2 teeth – No cavity preparation, cotton was inserted into the chambers from the apical end of the canals and 3-4mm of Cavit™ was place into the apical openings.
- Root surface of all teeth were covered with tray adhesive. Each tooth was mounted in Willytec dual-axis Chewing Simulator and submerged in India ink mixed with broth containing S. gordonii.
- Samples were assessed after 3 months.

Results:

- All positive control had dye and bacterial penetration.
- None of negative control teeth had dye or bacterial penetration.
- All of KS group (100%) debonded, 9 of them had dye and bacterial penetration and 21 of them had dye penetration only.
- 18 teeth (60%) of KSSB group debonded, 2 had both dye and bacterial penetration, 13 had dye penetration only and 3 had neither. Of the 12 teeth that remained intact, 1 had dye and bacterial penetration, 7 had dye penetration only and 4 had neither.
- KS group was 1.67 times more likely to debond than KSSB group. KS group had 1.3 and 3 times more dye and bacterial penetration, respectively, than KSSB group.

Conclusion:

- Stainless steel band helped maintain integrity of KS restorations under simulated masticatory function.
- Stainless steel band helped prevent dye but not bacterial penetration.
- The author suggested that Cavit™ placed under interim restoration might prevent bacterial penetration even when debonding or fractures occur.
- The authors found, in this study, no association between dye and bacterial penetration

LOE: 5
Title: Influence of the NiTi rotary system on the debridement quality of the root canal space

Author: Gustavo D et al


Reviewed by: Sheerin Yusuf, DMD

Purpose: The present study was designed to test the null hypothesis that there is no significant difference in debridement quality promoted by 3 nickel-titanium (NiTi) rotary systems.

Materials and Methods: One hundred twenty-two adult subjects voluntarily participated in the present study. The teeth were scheduled for extraction owing to advanced periodontal disease or non restorability. The mean age was 42.8 years. Pulpal vitality was initially performed using Green Endo-Ice® refrigerant spray. Teeth were then isolated with a rubber dam, and a standard coronal access opening was prepared. After confirmation of a pulpal hemorrhage, the tooth was included for the study. After control of pulpal hemorrhage, a sterile cotton pellet was placed in the pulp chamber, and the coronal access was then sealed with Cavit™. The tooth extractions were performed using a conventional root surgical technique. After each extraction, the tooth was immediately placed into a 15 mL plastic vial containing 10 mL buffered 10% formalin.

- **Root canal preparation**
  A silicone impression material was mixed to provide a matrix that simulated the bony socket site. Teeth were placed into the unset silicone and glued with tray adhesive. The use of different NiTi rotary systems resulted in 3 experimental groups (G1-Hero® 642 rotary system, G2-K3™ rotary system, and G3-Protaper®) with 20 specimens each. The 7 remaining teeth were used as histologic control samples.

- **Histological assessment**
  Teeth were embedded in paraffin wax and oriented parallel to the long axis of the root canal. Serial cross-sections of 0.6m thickness were obtained. Sections were mounted on glass slabs and stained with hematoxylin-eosin.

- **Morphometric evaluation**
  The specimens were visualized in an Axioplan 2 Imaging full motorized light microscope. The image of root canal cross section was displayed in a 19-inch high-contrast LCD monitor, and a precision optical computer mouse was used to trace the outline of the area of interest. In this way, the cross-sectional area of each root canal and remaining pulp tissue were measured. The percentages of remaining pulp tissue area were calculated for each root canal.

Results and Discussion: All of the microscopic images for the positive control group displayed a substantial amount of residual pulp tissue. Overall, the pooled data obtained from all levels revealed a variable amount of remaining pulp tissue for all experimental groups, ranging from 2.1 to 28.9 micro m. Remaining pulp tissue existed in 96% of the specimens. However, the Kruskal-Wallis H test results showed that there were no significant differences among the experimental groups. The results showed no differences in root canals prepared by the ProTaper®, Hero® 642, or K3™ NiTi system. Although instrumentation is a crucial step in the final prognosis of endodontic treatment, it must always be connected to an effective irrigation protocol.

LOE: 5
Title: Wound healing of apical tissues after root canal therapy: a long-term clinical, radiographic, and histopathologic observation study.

Author: Ricucci D etal.


Reviewed by: Chinchai Hsiao, DMD

Purpose: To evaluate the pulp healing process and the dentin-cementum complex in 51 endodontically treated human teeth after long observation periods and to correlate histologic observations with conventional periapical radiographic findings

Materials and Methods:

- 77 endodontically treated teeth with no clinical signs were extracted at the follow-up period (1999-2003) either due to the tooth being unrestorable or being exposed to the oral environment who had received root canal therapy by one of the authors in practice from 1983-2003.
- 2 intact teeth without endodontic therapy were used as negative control samples.
- 51 out of 77 cases were included after stringent evaluation by 3 endodontists.
- All endodontic treatments were performed following a standard protocol. One percent NaOCl was used as irrigant and vital teeth were completed in one visit and 2 visit with Ca(OH)2 or metacresylacetate dressing for necrotic pulps.
- Longitudinal or cross cut sections were obtained and every fifth slide was stained with H & E and a modified Brown and Brenn technique for staining bacteria.
- Teeth were divided into 3 groups: 1. Teeth with irreversible pulpitis (27), 2. Teeth with a necrotic pulp with or without apical periodontitis (22), 3. Retreated teeth (2).
- Histologic criteria used were:
  1. Presence of debris (none, sparse, abundant)
  2. Presence of necrotic tissue (none, superficial, partial, complete)
  3. Histologic status of any vital tissue in the apical portion of canal. (Severe, moderate, none)
  4. Histologic status of any periodontal tissue fragment attached to the apical portion close to the foramen. (No inflammation, mild-moderate, severe)
  5. Presence of cementum formation in the apical root canal. (None, minimal, diffuse, complete)
  6. Presence of bacteria in the apical root canal. (yes, no)
  7. Presence of bacteria in the coronal portion of the canal (yes, no)

Result:

- 2 out of 27 in the vital cases, 1 out 22 in necrotic case and 1 out of 2 in retreatment showed severe inflammation in the histologic status of tissue in the apical root canal.
- Moderate inflammation was seen in 6/27 of vital cases and 6/22 in necrotic cases and 1/2 of retreatment cases.
- Most of the teeth had abundant debris in the apical portion of the canal.
- Most of teeth had superficial necrosis in the apical portion of the canal.
- Bacteria were present in 47/49 of the coronal portion of the root canal.
- Only one case (V25) had bacteria in the apical portion.
- Cementum formation was diffuse i.e. abundant cementum formation was observed concentrically in most of the cases.

Discussion: The material presented here suggests that the apical tissue of carefully root-filled teeth, with no conventional signs of periapical change, is only rarely significantly inflamed. When the tissue is inflamed, microbial causes can always be demonstrated. In random observations from extracted root filled teeth, observations have been in agreement with Kronfeld who stated that most roots are slightly underfilled containing fibrous connective tissue, which has a tendency to form cementum. The root fillings, which were well performed, appear to have effectively prevented the complete penetration of bacteria to the apical foramen.

LOE: 4
Case Report:

- A 30 year old female patient referred by her general dentist for a “cystic-like lesion” in the region of the left mandibular second premolar.
- Dental history was noted for a tooth extraction of left lower first molar approximately 10 years before with placement of a metal crown bridge.
- Extra-oral exam revealed no facial asymmetry or paresis.
- Clinical tests revealed no tenderness to percussion, but the affected tooth felt different on palpation. The tooth was not mobile. Periodontal probing around the molar indicated pocket depths within the normal limit. Cold test was positive, but not distinct from the adjacent teeth.
- Panoramic and periapical x-ray film revealed one ill-defined radiolucent shadow (~10x8 mm) and containing a (5x3 mm) radiodense mass near the apex of the root, and widen PDL space was noted around the root, though lamina dura was intact.

Diagnosis and Treatment

- Differential diagnosis (of mixed RL and RO lesions) included infection, condensing osteitis (focal sclerosing osteomyelitis), and ossifying fibroma.
- Excisional biopsy planned.
- The hard tissue specimen pathology report revealed granulation tissue containing a tooth fragment with microscopic features of typical root structure with cementum and dentin. The soft tissue specimen revealed inflammatory granulation tissue with dense lymphoplasmacytic infiltration without evidence of malignant change.

Discussion/Conclusion:

- If root fragments unexpectedly remained in the socket during extraction of the tooth, they might cause traumatic injury to the surrounding tissue or bone structure during the surgical exposure.
- There are three conditions for leaving root fragments in the extraction socket wound:
  1) the root fragment must be <4-5 mm in length;
  2) the root fragment must be embedded in the bone structure deeply without exposure;
  3) the root fragment should not be associated with inflammation or infection.
- (In the present case, the root tip was approximately 6 mm in length and might have been associated with a local inflammation due to prior root canal infection.)
- The clinician must advise the patient of the risk of temporary or permanent paresthesia when excisional biopsy is performed. It is crucial to identify the anatomic location of the mental foramen to avoid injury during surgery. (In this case, the author evaluated their case using the Scanora multimodal x-ray, which combines panoramic dental radiograph with spiral tomography.)

LOE: 5
Title: The effect of different concentrations of EDTA on instrumented root canal walls

Author: Bilge Hakan Sen, et al.


Reviewed by: Christian Lehr, DMD

Purpose: To investigate smear layer removal and erosive capacity of different concentrations of EDTA on instrumented root canal walls.

Materials and Methods: Forty single rooted teeth were extracted. The crowns were removed at the CEJ and the working length was determined with a # 10 K-file by inserting the file into the canal until it could be seen at the apical foramen and subtracting 1mm from this length. The apical foramen was then sealed with wax to prevent irrigation through the foramen and to simulate in vivo apical counter pressure during canal preparation. Teeth were instrumented to size 45 hand file and flared in a step-back manner with # 50 through # 80 hand files. Teeth were irrigated with NaOCl throughout instrumentation. Teeth were then randomly assigned into 4 groups to receive either 1%, 5%, 10%, or 15% EDTA. EDTA solution was placed in the canals for 1 minute, canals were then irrigated with 2.5% NaOCl, and canals were finally rinsed with 2.5 mL distilled water. The roots were then grooved on the buccal and lingual surfaced with a fissure diamond bur and split with a hammer and chisel. Specimens were then examined with SEM at 1500 X magnification and evaluated for presence of smear layer and degree of erosion in a blind manner by 2 observers.

Results:

- Different concentrations of EDTA did not have a significant effect on smear layer removal.
- The sequential use of EDTA and NaOCl was less effective in smear layer removal in the apical third.
- 5%, 10%, and 15% EDTA demonstrated similar patterns of erosion, but 1% EDTA showed limited erosion.
- A significant negative correlation was observed between presence of smear layer and erosion.

Discussion and Conclusion: This study shows that different concentrations of EDTA had no effect on smear layer removal and that all concentrations were less effective in smear layer removal in the apical third. Also, 5%, 10%, and 15% concentrations of EDTA were all shown to cause more dentinal erosion than 1% EDTA. Based on these results, the usage of concentrations of EDTA can be recommended clinically for removing smear layer adequately and causing less erosion.

LOE: 5
Title: Coronal microleakage of four endodontic temporary restorative materials: an in vitro study

Author: Ciftci A, et al


Reviewer: A. Jayson Tengonciang, DMD

Purpose: To compare the sealing ability of the temporary restorative materials Cavit™G, Ketac™ Molar Easymix, and IRM to a new light-curing temporary material, Clip using a methylene blue dye penetration test.

Materials and Methods: Forty-eight extracted intact caries-free human premolar teeth were divided into six groups (+/- controls and one for each temporary material). The teeth were sectioned perpendicular to their long axis 3-mm below the cementoenamel junction. Standard endodontic accesses prepared (3.6X2.6mm). The teeth were dried, had a cotton pellet placed, and had at least 4mm thickness of temporary restorative material placed to seal the access. Next, the teeth were immersed in cold acrylic resin to the cementoenamel junction to ensure an apical seal. Then, the teeth were stored at 37°C in 100% humidity for 24 hours. The teeth were thermocycled for 500 cycles in distilled water at 5+/-2°C and 55+/-2°C with a dwell time of 30 seconds in each bath. After thermocycling 2 layers of nail varnish were applied to the enamel of the teeth. Teeth were placed in 2% methylene blue solution at neutral pH at 37°C and 100% humidity for 7 days. After the 7 days, the teeth were dried and sectioned mesiodistally through its long axis. The teeth were examined under stereomicroscope and evaluated.

Results and Discussion: A minimum of 3.5-4mm of restorative material is necessary to prevent micro leakage. The degree of microleakage was classified with the following criteria:

<table>
<thead>
<tr>
<th>Degree</th>
<th>Criteria</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>No dye penetration in the filling material or along the filling-tooth interface</td>
</tr>
<tr>
<td>1</td>
<td>Dye penetration into the filling material or along the filling-tooth interface up to the enamel dentin interface</td>
</tr>
<tr>
<td>2</td>
<td>Dye penetration into the filling material or along the filling-tooth interface up to filling edge</td>
</tr>
<tr>
<td>3</td>
<td>Dye penetration into the filling material or along the filling-tooth interface up to the endodontic cavity (cotton pellet discolored)</td>
</tr>
</tbody>
</table>

The found dye penetration scores for the restorative material were:

<table>
<thead>
<tr>
<th>Group</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cavit™</td>
<td>-</td>
<td>7</td>
<td>1</td>
<td>-</td>
</tr>
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<td>IRM</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8</td>
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<tr>
<td>Ketac™</td>
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<td>-</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Clip</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Conclusions: The results of this study indicate that Clip seals against marginal leakage as effectively as Cavit™ when used as a temporary filling.

LOE: 4