Title: Timing for composite resin placement on mineral trioxide aggregate

Author: Tsujimoto M et al.

Journal: JOE, Vol. 39, Number 9, p. 1167

Reviewer: Milad Azadi, DMD

Purpose: To investigate the proper time to restore composite resin over mineral trioxide aggregate (MTA).

Materials and Methods:

- 35 samples of MTA blocks were divided into 7 groups with 3 different times, 10 min, 1 day and 7 days, selected for restoring the composite resin over MTA with and without bonding resin.
- Control group of MTA with moist cotton pellet and hydraulic temporary cement placed on top for 21 days was added for comparison.
- 21 days after MTA mixing, all samples were embedded in epoxy resin, maintained for 1 week and cut longitudinally into halves.
- Samples were observed using an operating microscope and scanning electron microscope.
- Distances between MTA and composite resin or between MTA and bonding agent on longitudinal planes were measured at 5 points at 0.5 mm intervals at the interface.
- Microhardness measurements were performed with a Vickers microhardness tester. Microhardness was measured on the MTA surface at 5 points at 0.5 mm intervals at a 200um of distance from the interface using a Vickers indenter at a 50-gram force load and with a 5-second dwell time.

Results: There were no gaps at the interface in the 10 min groups, 1 day group with bonding agent and the 7 day group with a bonding agent. One and 7 day groups without a bonding agent presented a separation or gap at the interface. The value of the Vickers microhardness in the 1 day groups was significantly decreased compared with those of the other groups regardless of the presence or absence of a bonding agent.

Discussion: Microhardness of MTA is affected by many factors, such as pH, humidity, setting time, thickness of the material, condensation pressure, acid etching procedure, setting conditions, and EDTA treatment. In the 10 minute groups, interlocking areas were observed at the interface caused by the roughness of the MTA and the microhardness of the MTA at the interface showed a high value similar to the control. Etching did not disturb the microhardness of the MTA. Early covering of MTA with composite resin allows for sufficient moist curing and does not prevent the setting reaction of the MTA. Dehydration of the MTA surface because of air drying before composite resin filling resulted in the prevention of moist curing and a significant decrease in the microhardness. When hydration during the MTA setting process is guaranteed, composite resin with a bonding agent over MTA can be restored almost immediately after MTA mixing during a single visit.

LOE: 5
Comparative antibacterial efficacies of hydrodynamic and ultrasonic irrigation systems in vitro

Cachovan G et al

JOE, Vol 39, No. 9, 1171-1175

Sahee Kim, DMD

To compare the bactericidal effects of hydrodynamic (Rinsendo), passive ultrasonic irrigation (PUI) and manual irrigation.

Materials and Methods: Two hundred fifty single root extracted teeth were divided into two groups of 100 and 150.

- Group I: 100 single root teeth divided into four subgroups of 25 teeth each (Untreated, RinsEndo, PUI, and Manual).
  - Each subgroup was treated with NaCl.
- Group II: 150 single root teeth divided into three subgroups of 50 each. The three subgroups are classified as E. Faecalis, mixed aerobic, mixed anaerobic. Within each subgroup of 50 there were five subgroups of 10 teeth each: 1- no treatment, 2- RinsEndo with NaOCl alone, 3- RinsEndo with NaOCL / CHX, 4- PUI with NaOCl alone, and 5- PUI with NaOCl/CHX.

Microbial samples were at 2 and 5 days.

Results: The PUI fared better than RinsEndo while both (PUI / RinsEndo) fared better than manual. All three (PUI / RinsEndo / manual) fared better than control at reducing bacterial count. Results were the same for the three groups of 50 teeth each.

- RinsEndo or PUI system with NaOCl / CHX combo is better than RinsEndo or PUI with NaOCl alone.
- PUI system using NaOCl alone is better at reducing bacterial count than RinsEndo system using NaOCl.
- RinsEndo system using NaOCl / CHX combo is better at reducing bacterial count than PUI using NaOCl / CHX combo.

Discussion: PUI mechanisms of eliminating bacteria: high frequencies of 30 kHz streaming the irrigant within root canal followed by high temperature generated by ultrasonic movement. RinsEndo mechanism: pressure-suction agitated the irrigation solution within the root canal with flow rate of 6.2 cc/min and 1.6 Hz pulse frequency thus improving circulation and flow of irrigant into difficult to access areas of root canal and promotes dentin penetration. Of the irrigants:

- CHX: antimicrobial and long lasting.
- NaOCl: antimicrobial. More toxic then CHX.
- In vivo combination NaOCl / CHX more efficient than NaOCl alone. However manufacturer of RinsEndo recommends using NaOCl alone since the combination of NaOCl / CHX is associated with tooth discoloration and risk of leaching of unidentified substance into surrounding tissues. NaOCl precipitates with CHX so if using the combination, than NaOCl should be completely removed before using CHX.

Conclusion: Both irrigation systems reduced bacterial in root canal more effectively than manual syringe needle. PUI was more effective when used with saline but RinsEndo was more effective with used when antibacterial irrigants. Hydrodynamic irrigation with NaOCl / CHX was the most effective regimen.

LOE: 5
Title: Comparison of warm vertical compaction protocols to obturate artificially created defects in the apical one-third

Author: Perry C., et al.


Reviewer: Nadia Liss, DMD

Purpose: The aim of this in vitro study was to evaluate the ability of 4 different warm vertical compaction protocols to obturate artificially created defects in the apical one-third of a root canal system by using a split-tooth model.

Materials and Methods: Extracted human maxillary central incisors were selected with crowns removed at CEJ, roots embedded and longitudinally sectioned in B-L direction through the center of root canal system. Working length (WL) was established with #10 SSK file on one of the root halves, 0.5mm from the anatomical apex. The two halves then bolted together. The crown-down technique was used to instrument to #50 (0.04 ProFile, Dentsply). The halves were separated to ensure equal canal preparation on both sides. Three artificially created defects were placed 2, 3, and 4 mm from the apex of the split-tooth model (apical 2-mm ¼-round defect in palatal wall; apical 3-mm ½-round defect in buccal wall; apical 4-mm ½-round defect in palatal wall). Before each obturation, silicone lubricant (WD-40) was applied to both halves to permit GP removal; a fine-medium (.08 taper) System B plugger was prefitted 4 mm from the working length, and heated to 220° C; the Calamus (Dentsply) set at 180°C for the backfill. Four warm vertical protocols used:

- continuous down-pack (leaving 4mm of GP) and continuous backfill to CEJ
- continuous down-pack and incremental backfill (2mm increments)
- incremental (2mm increments) down-pack (leaving 4mm of GP) and continuous backfill
- incremental down-pack and incremental backfill

The root canal system was obturated 10 times by one individual using protocol A, then following other 3 protocols. Resultant obturations (N = 10/ protocol) were separated from the model, and replicated defects were assessed by a blinded evaluator who used a dental operating microscope (Zeiss Meditec) X 10 magnification. Scoring criteria based on how much each defect was replicated by GP:

- 0 = no reproduction of the defect
- 1 = ≤ 25% reproduction
- 2 = >25%–50% reproduction
- 3 = >50%–75% reproduction
- 4 = >75% to complete reproduction of the defect

Results: By using nonparametric analyses with Bonferroni adjustment (a = 0.01), with the apical 2-mm defect, protocol D demonstrated significantly (P ≤ .01) better defect replication as compared with protocols A, B, and C. For the apical 3- mm defect, protocols B and D were significantly better (P ≤ .01) than protocols A and C. However, there was no difference (P > .01) between protocols with apical 4- mm defect (100% replication).

Conclusion: The incremental down-pack with incremental backfill appears better able to replicate the most apical defect, which suggests benefits of repeated heat application and packing force to manipulate the GP in the apical plug area.

LOE: 5
Title: Infection in a complex network of apical ramifications as the cause of persistent apical periodontitis: A case report

Author: Arnold M et al.

Journal: JOE, Vol. 39, Number 9, 1179

Reviewer: Sean Nguyen, DMD

Purpose: This article reports a case of persistent apical periodontitis lesion in a mesiobuccal root of a maxillary molar subjected to single-visit endodontic treatment.

Materials and Methods:

First Appointment –
- 51 y.o. male was referred to endodontist by his general dentist who initiated RCT #14.
- RCT by the endodontist was performed based on optimal standards, including apical preparation with reasonably large nickel-titanium instruments at an adequate WL (0.5mm) short, establishment and maintenance of apical foramen patency throughout the procedures, copious irrigation with highly concentrated (5%) NaOCl, smear layer removal, and a final rinse with and ultrasonic agitation of chlorohexidine.
- Canals were dried and filled with gutta-percha and 2seal using Schilder’s vertical compaction technique.
- Tooth was restored with post and composite. Temporary was then placed.

6 Month Recall- Tooth presents with a permanent crown and was asymptomatic. Radiographs showed the radiolucencies on the P and DB roots to be reduced, whereas the lesion on the MB root remained the same size.

1 year & 6 months Recall-
- Pt schedules appt after noticing buccal swelling and sinus tract in region of #14.
- At the appt, sinus tract was no longer present and there was no tenderness to palpation and percussion.
- Radiographs show healed P and DB periapical lesions, but the radiolucency on MB has become larger.
- CBCT showed a large radiolucency associated mainly with MB root apex with corticated margins.
- Surgery on MB root was initiated. Soft tissue was enucleated from the bone crypt.
- The surface of the MB root showed no signs of cracks, fractures, or accessory root canals.
- Histological examination was done for the root tip with the soft pathological tissue and 2 buccal cortical bone fragments.

11 months post-surgery- Tooth was asymptomatic and radiographs showed that healing was almost complete.

Histopathologic Results: Section of the MB root tip revealed the presence of a complex root canal system in the apical third, with an apical delta with numerous foramina. The lesion had the characteristics of a “pocket cyst” and the lumen of the cyst cavity was in direct continuity with the root canal through the major apical ramification.

Discussion: In this case report, bacteria persisting after treatment were arranged in biofilm structures located in an intricate network of apical ramifications that remained unaffected by treatment. The reason why the lesion on the MB root persisted after treatment is probably a more complex anatomy of this root, making single-visit disinfection less effective. Treatment was performed in a single visit, and whether or not an interappointment medication would have improved prognosis can only be speculated at this time. However, it is unknown whether a single dressing of Ca(OH)₂ would have helped very much in a complex case like the one reported here. The alkaline substance has low solubility, and as it diffuses through organic or inorganic tissues, its pH is reduced and may not reach enough magnitude to kill bacteria in ramifications.

LOE: 5
Title: Misdiagnosis of a nasopalatine duct cyst: A case report.

Author: Hilfer PB and *et al*.


Reviewer: Ricky Gonzalez-Lopez, DMD

**Introduction:** Non-endodontic lesions mimicking apical periodontitis and their misdiagnosis can be found frequently in the literature. The incisive canal cyst or nasopalatine duct cyst (NPDC) is a nonodontogenic cyst that may be radiographically superimposed over the apices of the maxillary central incisors roots.

**Purpose:** This report describes a case of a persistent sinus tract of assumed endodontic origin in which a tooth was ultimately extracted. Subsequent surgical intervention and histologic examination confirmed the nonodontogenic diagnosis of an NPDC.

**Case Report:**

- 20 y/o healthy male with chief complaint of occasionally slight swelling and drainage on the midline of his anterior palate without pain of additional symptoms.
- Hx of trauma to tooth #9, subsequent RCT with periodontal splinting approximately 8 years ago.
- Radiographs showed a large apical radiolucency associated with teeth #8 and #9, with gutta-percha tracing a palatal sinus tract to the apex of previously treated RCT tooth.
- Retreatment done, with calcium hydroxide for three months (two changes in between)
- Continued drainage, non-resolution of the palatal sinus tract, and lack of reduction on lesion size noted.
- Assuming a root fracture and extraction was done.
- Patient came back after 8 months (because of military service patient was away for this time) with identical preoperative symptoms and a persistent sinus tract. The patient was then referred to endodontic/periodontal evaluation.
- Vitality test done, 7,8,10, and 11 all vital.
- A CBCT taken and read by an oral and maxillofacial radiologist revealed a large palatal defect approximating the nasopalatine canal.
- Full thickness flap done and a well circumscribed cystic lesion was noted midline between the apices of teeth #8 and #9.
- The surgically enucleated lesion was dissected and was submitted for histologic examination.
- Palatal defect was corrected with xenograft and resorbable collagen barrier.
- The patient came asymptomatic in a 2-week F/U visit with resolution of the palatal sinus tract.
- The oral pathology report confirmed an NPDC as the final diagnosis.

**Discussion:** In this case of a particular diagnostic dilemma, with no overt indications of root fracture, had the general dentist considered specialty referral before extraction, the likely recommendation would have been to alternatively proceed with exploratory surgery and biopsy.

**Conclusions:** The extraction in the case presented, due to an equivocal differential diagnosis based on previous trauma and endodontic history, highlights the need for continued awareness and education. An increased understanding of anatomic variances, the use of appropriate diagnostic test to include CBCT imaging, and key examination techniques to distinguish endodontic lesions form nonendodontic pathoses are imperative for an accurate differential diagnosis and appropriate treatment outcome.

**LOE:** 5
Title: Retrieval of extensive gutta-percha extruded into the maxillary sinus: Use of 3-dimensional cone-beam computed tomography

Author: Brooks, J et al.

Journal: J Endod;39 (9):1189–1193

Reviewer: Ashley Gonsky, DMD

Introduction: The roots of maxillary teeth are in close proximity to the maxillary sinus which may lead to the inadvertent deposition of endodontic products into this region. The injectable thermoplasticized gutta percha technique may predispose this occurrence due to the absence of an apically positioned master cone. As a consequence of overfilling, surgical retrieval of the gutta percha may be necessary. This paper details a case report of extreme overextension of gutta-percha within the maxillary sinus after endodontic retreatment on tooth #14.

Materials and Methods:
- #14 was retreated: gutta percha was removed, 3 canals were re-instrumented and re-irrigated.
- DB and P canals were obturated with gutta-percha master cones and backfilled with thermoplasticized injectable warm gutta-percha.
- MB canal was filled only with thermoplasticized injectable warm gutta-percha, which led to extrusion.
- Imagery with 3-D CBCT was performed for localization of the gutta-percha in the maxillary sinus.
- Caldwell-Luc approach was undertaken to remove the extruded material.

Results: The gutta-percha was successfully removed intact. The patient continued to have mild tenderness to palpation in the sinus region. Otherwise, the postoperative course was uneventful.

Conclusions: This case report illustrates the consequences of over-instrumentation and the lack of an apical stop. In such cases, obturation with thermoplasticized injectable gutta percha (without a master cone) creates a risk of overfilling the canal and depositing gutta percha into the maxillary sinus. Use of 3-D CBCT could enhance endodontic diagnosis, serve as an aid for visualization of foreign materials within the sinus and contiguous soft tissue structures, and improve clinical outcome.

LOE:4
Chapter 2: Treatment Planning Considerations for Endodontically Treated Teeth

- RCT can be performed on almost any tooth but restorability must be determined prior to endodontic treatment
- Communication among the various treating dentists before, during and after RCT offers the best possibility of an optimal outcome
- Assessment of Crack/fractured teeth: Craze lines: because pulp generally not involved, no treatment is necessary. Infraction: fracture of hard tissue in which the parts have not separated. Infractions can be symptomatic when infractions become invaded by bacteria – may require RCT

Chapter 3: Treatment Options and Materials for Endodontically Treated Teeth

- Composite resin appears to be an acceptable core material when substantial coronal tooth structure remains but a poor choice when a significant amount of tooth structure is missing
- Some disadvantages of using composite resin for a core material is its instability in oral fluids and polymerization shrinkage

Chapter 12: Repair of Perforations in Endodontically Treated Teeth

- Once the perforation is identified, NaOCl provides an environment that removes inflammatory tissue, controls hemorrhage, disinfects the perforation site and conditions the surrounding dentin
- NaOCl should always be delivered passively or placed in the pulp chamber and gently transported along the main canal using hand files avoiding penetration of the wound site
- Retrograde Management of Perforations: must consider the following
  - Amount of remaining bone and osseous defects
  - Overall periodontal status
  - Duration and size of the defect
  - Surgical accessibility
  - Soft tissue attachment level
  - Patient’s oral health and medical status
  - Surgeon’s soft tissue management expertise

LOE: 5
Title: A survey of dentists' preferences for the treatment of teeth with apical periodontitis

Author: Azarpazhooh A et al.


Reviewer: Christopher Maguire-Adams, DMD

Purpose: Apical Periodontitis is a host response to a microbial challenge within the root canal system that results in inflammation and destruction of periapical tissues. It can be treated by either Root canal treatment or by extraction of the impacted tooth. This study surveyed the preferences of Ontario, Canada dentists for teeth with apical periodontitis when selecting between retention via root canal treatment (RCT) and extraction without replacement, or replacement with implant-supported crowns (ISC), fixed, or removable partial prostheses.

Materials and Methods: Two methods were used to distribute the survey. A mail-out survey (census of Ontario endodontists, periodontists, prosthodontists, and oral and maxillofacial surgeons; n = 498, 40% response rate). The mailing was repeated 3 times over a 3 month period. It included a cover letter outlining the aim of the study and included a prepaid return postage envelope. A Web-based survey (sample of Ontario general dentists; n = 1983, 15% response rate) were conducted. Participants ranked their treatment preferences for 4 clinical scenarios: an anterior or posterior tooth, without or with previous RCT. Associations between treatment preferences and covariates were explored by using bivariate and logistic regression analyses ($P \leq .05$).

Results: For all 4 scenarios, the majority of participants preferred either Root Canal Treatment (RCT) or Implant Supported Crown (ISC), whereas other treatment options were preferred by ≤3.1% of the participants in any professional registration category. A pattern of declining preference for RCT and increasing preference for ISC was noted across the scenarios, with significantly lower preference for RCT and higher preference for ISC associated with teeth needing repeated RCT compared with initial RCT (odds ratio [OR] = 3.3; confidence interval [CI], 2.5–4.4). Preferences were significantly lower for RCT and higher for ISC among general dentists (OR = 6.4; CI, 2.3–17.6), prosthodontists (OR = 9.1; CI, 3.0–28.3), periodontists (OR = 18.3; CI, 6.4–51.6), and surgeons (OR = 30.1; CI, 10.8–86.6) when compared with endodontists. The author noted that it was not surprising that the majority of endodontists who routinely provide endodontic treatment preferred RCT over alternative modalities they do not provide on a regular basis. Conversely, periodontists and OMS who provide implant dentistry preferred tooth replacement with ISC over the alternative modalities they do not provide. Also noted was the preferences of GPs and prosthodontists, who may provide both RCT and Implant dentistry, were less skewed than those of endodontists toward RCT and those of periodontists and OMS towards ISC. Because GPs and prosthodontists routinely restore the tooth or implant and witness the restorative outcomes over time, they may take into account factors related to restorations when considering treatment for teeth with AP, such as time to complete treatment, perceived long-term restorative outcome, cost of maintenance, and patient management.
Conclusions: More surveyed dentists preferred Root Canal Treatment than Implant Supported Crown for teeth with apical periodontitis requiring initial RCT than repeated RCT. The dentists’ preferences were associated with their professional registration but not with other characteristics.

Side Note: Dr. Azarpazhooh interviewed at TUKSoD Dept of Endodontics on Nov 6, 1013.

LOE: 5
Title: Radiographic healing after a root canal treatment performed in single-rooted teeth with and without ultrasonic activation of the irrigant: A randomized controlled trial

Author: Liang Y et al.


Reviewer: Hao Tran, DDS

Purpose: To compare the outcome of root canal treatment with and without additional ultrasonic activation of the irrigant in a randomized controlled study of 105 patients at Peking University School of Stomatology, Department of Cariology and Endodontics.

Materials and Methods:

- Single-rooted teeth with radiographic evidence of periapical bone loss
- Exclusion: Pregnant women, curved canals >25 degrees, PD > 3mm
- 2 treatment groups: use of ultrasonic and without ultrasonic.
- 10 to 19 month follow-up
- Examined by periapical radiography (PA) and cone-beam computed tomography (CBCT) by 2 reviewers
- Area and volume of the periapical lesions were measured
- 4 categories: absence of radiolucency, reduction, enlargement or uncertain.
- Lesions were classified as reduced or enlarged when the change in size of the radiolucency was 20% or more.
- 4 dentist with 5yrs or more experience in GD or Endo
- Instrumentation to size #40 regardless of canal size. 40-30 gauge needle with 5.25% NaOCl irrigation 2mm from WL. 15% EDTA.
- 10 sec ultrasonic

Results:

- 86/105 (82%) patient were recalled after 10-19months.
- 84 teeth analyzed (2 teeth extracted for reasons unrelated to RCT).
- Percentages of absence and reduction of the radiolucency together revealed by CBCT and PA were similar
- Absence/ reduction of radiolucency in the ultrasonic group: 39 of 41 teeth (95.1%)
- Syringe group: 38 of 43 teeth (88.4%).
- However, no significant difference between the results of the 2 groups (P = .470).
- No significant difference between both groups in the volume of the periapical lesions (P = .148).

Discussion: Short term follow-up can underestimate the percentage of absent radiolucency in lesions that are still healing. CBCT was more accurate than PA in determining reduction of PARL, but not significant (19% vs. 32.1%). Volume of lesion and size of master cone play a significant factor for reduction of PARL. Mater cone <45 had 22% complete reduction of radiolucency vs. master cone #50-120 with 11.1%. The irrigation method not significant.

LOE: 3
Title: Can apical periodontitis modify systemic levels of inflammatory markers?

Author: Gomes M et al.

Journal: Journal of Endodontics, Vol. 39, No.10; 1205-1217

Reviewer: Sean Nguyen, DMD

Purpose: This systematic review and meta-analysis investigated evidence to support whether apical periodontitis (AP) can modify the systemic levels of inflammatory markers (IM) in humans.

Materials and Methods: The MEDLINE, Embase, Cochrane, and PubMed databases were searched between 1948 and 2012, with no language restriction. Additionally, the bibliography of all relevant articles and textbooks were manually searched. Based on inclusion and exclusion criteria, 2 reviewers independently rated the quality of each study based on the Newcastle-Ottawa Scale. The primary outcome variable for meta-analysis was determined by the serum levels of IMs in AP subjects versus healthy controls or in AP subjects before versus after treatment intervention.

Discussion:

- The results from the present study suggest that AP is associated with systemic inflammatory changes. In endodontic infections, there are several soluble bacterial products with a powerful proinflammatory potential.
- LPS are probably the best characterized components of endodontopathic bacteria to induce cytokines and other inflammatory compounds such as granulocyte-macrophage colony-stimulation factor, interferon gamma, IL-1 alpha and beta, IL-6, IL-8, macrophage chemotactic peptide-1, and TNF alpha.
- Chronic inflammatory conditions may continuously stimulate the liver to synthesize increased amounts of plasma acute phase proteins, and the hepatic reaction may sustain inflammation.
- Certain IMs related to AP such as alpha-1-acid glycoprotein are important drug-binding proteins that have the property to decrease the free plasma concentration of a great number of drugs and, consequently, their activity, which can also influence general health.
- The findings from the present study indicate that AP is associated with a generalized increase in systemic IMs and immunoglobulin levels when compared with healthy controls.
- CRP, IgM, and IgG were the most commonly investigated markers, and all of these markers were usually elevated in patients with AP.
- Although individual studies reported that the treatment of AP by tooth extraction, apicoectomy, or conventional endodontic therapy reduced the serum levels of IMs, findings from the present meta-analysis do not allow conclusions regarding the effectiveness of endodontic treatment in reducing the serum levels of the different biomarkers because a high methodological heterogeneity was present concerning interventional studies.

Conclusion: AP is associated with increased levels of systemic inflammation in humans. Meta-analysis results suggest that serum levels of IgA, IgG, and IgM are increased in humans with apical periodontitis compared with healthy controls and serum level of CRP, IgA, IgE, IgG and IgM were not significantly different between patients with AP before and after the treatment interventions. There is a clear need for large-scale prospective controlled studies designed to directly test this hypothesis.

LOE: 5
Title: Area and 3-dimensional volumetric changes of periapical lesions after root canal treatments

Author: Van der Borden W et al.

Journal: JOE, 2013; 39(10), 1245-1249

Reviewer: Saehee Kim, DMD

Introduction: Periapical radiography (PA) is used to determine root canal treatment outcome and prognosis. However, PA may be unreliable at assessing outcome of root canal treatment when the lesions occur within the cancellous bone or in buccolingual direction. Cone beam computed tomography imaging (CBCT), on the other hand, can be used to assess lesion changes after root canal treatment by providing volumetric data of periapical lesions. No clinical studies have used CBCT to determine outcome of root canal treatments.

Purpose: Using PA and CBCT imaging to measure the changes in lesion size and assess the outcome after root canal treatment.

Material & Methods: Forty-two of 56 patients with periapical lesions were followed for 10 to 37 months after root canal treatment by one operator. Seventy-one selected roots showed preoperative periapical radiolucency on PA and CBCT scans.

- Root canal treatments: shaping, cleaning (PUI with 2% sodium hypochlorite solution and 17% EDTA after instrumentation), obturation (Vertical condensation technique)
- Straight projection intraoral PA and CBCT scans done preoperatively and at recall.
- Software used to determine lesion area on PA and lesion volume on CBCT.
- Outcome presented in 4 categories: lesion undetected, reduced in size, unchanged, and enlarged.
  - Periapical lesion: radiolucency associated with radiographic apex of root at least twice the width of periodontal ligament space.
  - Reduced & enlarged lesions: 20% or more reduction or enlargement
  - Unchanged lesion: less than 20% change

Results: PA findings were different from CBCT.

- 39/71 (54.9%) roots where PA and CBCT in agreement.
- 32/71 (45.1%) roots, PA and CBCT not in agreement.
- Undetected lesions by CBCT scans were lower (15.5%) then PA (45.1%) with P<0.001.
- If the undetected and reduced lesions are combined together, then the P = 0.73 which is not statistically significant: CBCT (77.5%) vs. PA (88.7%).

Discussion: CBCT detected post treatment periapical radiolucency in 21 of 32 roots not seen on PA. CBCT imaging detected 44 roots with lesion reduction, while PA detected 31 roots only.

Conclusion: The study focused on comparison of outcome determined with PA and CBCT imaging. Lesion changes after root canal treatments determined with CBCT versus PA data were different. Using PA for outcome could be untrue.

LOE: 5
Title: Apical extrusion of debris using self-adjusting file, reciprocating single-file, and 2 rotary instrumentation systems.

Author: Kocak S et al.

Journal: JOE, Vol. 39, Number 10, p. 1278

Reviewer: Milad Azadi, DMD

Purpose: To compare the amount of apically extruded debris after the preparation of root canals in extracted human teeth using ProTaper, Revo-S, Self-Adjusting File and a reciprocating single-file system.

Materials and Methods: Sixty-eight extracted human mandibular premolars with single straight root canals were used. The teeth were accessed and a 15 K file was used to obtain patency and working length (WL). An experimental model using stoppers separated from Eppendorf tubes was used. Teeth were randomly divided into 4 groups according to the file used for the preparation of root canals:

- Group 1 – ProTaper instruments were used
- Group 2 – SAF instrument was used
- Group 3 – Revo-S instrument was used
- Group 4 - R25 Reciproc file used

In each sample, a total of 4 mL distilled water was used as the irrigation solution. Each tooth was inserted up to the cementoenamel junction and a 27 gauge needle was placed alongside the stopper for use as a drainage cannula and to balance the air pressure inside and outside the tubes. Each stopper with the tooth and needle were attached to the Eppendorf tube and the tubes were fitted into vials. Debris extruded during instrumentation were collected into the pre-weighed Eppendorf tubes. Eppendorf tubes were then stored in an incubator at 70°C for 5 days & weighed to obtain the final weight of the tubes when the extruded debris were included.

Results: There was no statistically significant differences in the amount of extruded debris among the groups. The ProTaper group produced the highest mean extrusion value and Reciproc produced less debris compared to the other groups.

Discussion: All instrument techniques were associated with extruded debris.

LOE: 5
Title: Efficacy of peracetic acid in rapid disinfection of resilon and gutta percha cones compared with sodium hypochlorite, chlorhexidine and povidone-iodine.

Author: Subba N and et.al.

Journal: JOE, Volume 39, Number 10, p. 1261

Reviewer: Raj Shenoy, DDS

Purpose: To compare the effectiveness of 3% sodium hypochlorite (NaOCl), 2% chlorhexidine, 1% peracetic acid (PAA), and 10% povidone-iodine on rapid disinfection of gutta percha and Resilon cones contaminated with Enterococcus Faecalis and Bacillus subtilis.

Materials and Methods: One hundred twenty-eight of each gutta-percha and Resilon cones. The cones were placed in microbial suspensions of E. Faecalis and B. subtilis containing Muller-Hinton broth. The cones were then tested for disinfection according to type of solution (3% NaOCl, 2% chlorhexidine, 1% peracetic acid, or 10% povidone-iodine), the time of exposure to each solution (1 or 5 minutes), and type of microorganisms (E. faecalis or B. subtilis) observed. After disinfection the samples were placed in test tubes of Mueller Hinton broth and incubated at 37°C for 7 days. All test tubes were observed at 24 hour intervals and visually checked for turbidity (signifying microbial growth).

Results: One percent peracetic acid (PAA) showed the best results for both 1 minute and 5 minutes of disinfection. Two percent chlorhexidine showed the second best results but was statistically equal to peracetic acid. Three percent NaOCl was third in disinfection. Povidone-iodine showed the least effect within all the groups for both contact times.

Conclusion: This study confirmed the effectiveness of 1% peracetic acid and 2% chlorhexidine in rapid disinfection of both gutta percha and Resilon. Further studies need to be done to evaluate the effects of disinfectants on changes in the physical properties of these obturating materials.

LOE: 5
Title: Investigation of cultivable bacteria isolated from longstanding retreatment-resistant lesions of teeth with apical periodontitis

Author: Signoretti F et al.

Publication: Journal of Endodontics, Vol.39 (10)1240–1244

Reviewer: Nadia Liss, DMD

Purpose: The objective of this research was to investigate the presence of viable bacteria in tissue samples from persistent apical lesions and to correlate the microbiological findings with the histopathological diagnosis of the lesion.

Materials and Methods: Twenty persistent apical lesions associated with well-performed endodontic retreatment were collected, with following symptoms: swelling, pain on palpation, tenderness to percussion, radiographic lesion, and time after retreatment of 12–24 months and >24 months. Excluded from study: sinus tracts (in order to exclude chronic apical abscess), periodontal probing depths >4 mm, or root fracture and patients treated with antibiotics over the last 3 months. Teeth with satisfactory canal filling included. Patients requiring retreatment because of missing canals separated endodontic instruments, root canal deviations, and perforations or calcified root canals in which the apex was inaccessible, and inadequate endodontic filling were excluded.

All patients treated by the same surgeon, using dental operating microscope. Rinse with 0.2% chlorhexidine gluconate and swabbing of the surgical area with 2% chlorhexidine gel were performed to avoid external contamination. After the reflection of the flap, periosteal tissue samples were collected from accessed root end and areas adjacent to the surgical site using curettes and absorbent paper cones to test for bacterial contamination. A portion of the periradicular tissue removed by curettage was stored in transport medium for culture analysis, and the remaining tissue was immersed in 10% neutral buffered formalin for further histopathological examination. Tissue samples were processed through culture techniques including serial dilution, plating, aerobic and anaerobic incubation, and biochemical tests for microbial identification followed by histopathological diagnosis.

Results: Cysts were more frequently diagnosed (13/20). Strict anaerobic species predominated in both cysts (80.4% of the species detected) and granulomas (65% of the species detected). Viable gram-positive bacteria were frequently recovered from apical lesions (cyts = 70.6%, granulomas = 84.4%). *Gemella morbillorum* and *Propionibacterium acnes* were the most frequently recovered species from cysts and granulomas, respectively. At least 1 gram-positive bacterial species was present in almost every sample (cyts = 12/13, granulomas = 7/7). No significant correlation was found between histologic findings and bacterial species.

Conclusion: Although cysts were more frequent than granulomas in cases of failure of endodontic retreatment, bacteria were isolated from both types of lesions, with a predominance of gram-positive species, suggesting that these species can survive outside the root canal and might be related to the persistence of the pathological process even after accurate endodontic retreatment.

LOE: 5