Title: A survey on the experience of UK endodontists and general practitioners in the management of intra-canal fractured endodontic files

Author: A. Madarati et al., 2008


Reviewer: Avedis Encioiu, DDS

Purpose: To investigate the attitudes of general dentists and endodontists in the UK towards the management of fractured endodontic files (SEF).

Materials and Methods:

- Questionnaire sent to 330 systematically selected GDPs and all endodontic specialists (170) in the UK.
- Cover letters also sent, explaining aims of the study and that all information would remain confidential.
- Non-respondents were sent another 2 mailings with differently worded cover letters and the same questionnaire.
- Chi-squared test analysis performed.

Results and Conclusions:

- 75% overall response rate (82.82% endodontists vs. 70.92% GDPs)
- 18.5% of respondents reported they would retrieve fractured files in apical 1/3 (25.9% endodontists vs. 14% GDPs)
- Ultrasonic use for removal of SEF was reported by 98.5% of endodontists vs. 75.8% GDPs.
- 67% of respondents reported that the most common complication of SEF retrieval was excessive removal of dentine.
- 88.5% reported they would leave the un-removed file in situ and obturate the root canal.
- The results showed that both endodontists and GDPs are aware of the limitations of root canal anatomy when considering SEF removal.
- Excess dentine removal was the most common complication encountered, indicating need for a more conservative approach.
- Both endodontists and GDPs demonstrated a conservative approach towards the unsuccessful management of SEF.
Title: Comparability of results from two leakage models

Author: Erick Miranda Souza et al.


Reviewed by: Joseph Gupana, DMD

Purpose: The purpose of this study was to investigate the comparability of leakage results of the same specimens recorded in the fluid transport model and glucose penetration model.

Materials and Methods:

- 100 recently ext. maxillary and mandibular single canal canines selected, coronal parts removed leaving 15mm roots
- Each canal was instrumented to size 50 K-file with step-back flaring in 2mm increments with Gates Glidden. Canals were rinsed with 2% NaOCl solution along with 1-minute ultrasonic irrigation.
- Roots were divided into 4 groups (20 each) according to sealers tested - AH26, AH Plus™, RSA, and Polifil® (castor oil polymer).
- All sealers were introduced into the canal twice with a bidirectional spiral for 5secs. A size 50 gutta percha cone coated with sealer was placed into canal with 2 accessory cones. No spreader was used.
- 11mm of coronal gutta percha was removed immediately, leaving 4mm of apical gutta percha.
- The positive control - lateral compaction of gutta percha performed without sealer
- Negative control - filled with 3 gutta percha cones and AH26 and external surface was completely covered with cyanoacrylate.
- Specimens stored for 1 month at 37°C at 100% humidity.
- **Fluid Transport** – Roots mounted on model. 30-kPa headspace was applied for 3h, 6h, and 24h and bubble movement was recorded (Fig 1.A).
- **Glucose penetration** – Twenty-four hrs after finishing fluid transport, samples were mounted on glucose penetration model (Fig.1, B). Glucose was placed into reservoir and a 30 kPa headspace pressure was created. After 24hrs a sample of 100μL was taken from apical reservoir and glucose conc. was measured.

Results:

- No movement of air in negative controls and all positive controls showed bubble movement
- No glucose penetration in negative controls, all positive controls had glucose penetration
- RSA showed best sealing and AH Plus™ leaked the most
- No significant difference between RSA and Polifil®
- With fluid transport model, there was a significantly more leakage with sample after 24hrs that after 3h or 6h.
- A positive correlation was observed between the results of both models

Discussion: The results of study provide useful information about the 4 sealers. AH Plus™ has faster setting time but may cause shrinkage stress, RSA displayed effective sealing, Polifil® (polyurethane + zinc oxide) may become a promising endodontic sealer. Under the conditions of this study, results of the same specimens recorded in fluid transport model and glucose penetration model were similar.
Purpose: To examine tissue reaction to two root canal sealers. The sealers are calcium hydroxide based Sealapex™ and Acroseal.

Background: During and after root canal obturation, sealer will most likely come in contact with tissue. Calcium hydroxide based sealers work by slowly releasing calcium hydroxide and stimulating a favorable inflammatory reaction in the tissue that benefits the repair process/healing after RCT.

Sealapex™ has been used clinically and it has a good record in periapical healing. Acroseal is a new product and it does not have yet in vivo confirmation of its repair potential. A few studies reported it is cytotoxic and it has less calcium hydroxide release than Sealapex™.

Von Kossa technique of staining and the use of polarized microscopy to find bi-refrigerant calcium carbonate crystals are the two methods used in this study to find calcite crystals which form when calcium hydroxide leaches out into tissue.

Materials and Methods:
- Human teeth roots were instrumented, irrigated, and standardized to 7mm long (dentin wall width = 0.7mm). The root dentin tubes were sterilized and filled with the 2 sealers. Controls consisted of empty dentin tubes.
- 36 Wistar albino rats were used – each animal received 2 dentin tubes of the same kind. There were 3 groups of 12 rats. Group 1 received Acroseal filled tubes, Group 2 received Sealapex™ filled tubes, and the control (Group 3) had the empty tubes.
- The tubes were implanted in the backs of the animals subcutaneously. Half of the rats from each group were sacrificed at 7 days and the rest at 30 days. The tubes and the tissues around them were dissected and fixed in 10% buffered formalin. One of the tubes, at random, from each animal was embedded in paraffin, sectioned, and either stained with Von Kossa technique, or left unstained for polarized-light microscope examination. The other tube was demineralized in formic acid/ sodium citrate solution to be paraffin-embedded, sectioned, and stained with hematoxylin-eosin dye (used in inflammatory cell count)
- Reactions were scored as: no inflammation, mild inflammation, moderate inflammation, and severe inflammation, depending on the number of inflammatory cells observed around the openings of the tubes. Also fibrous capsules were said to be thin or thick and necrosis or calcifications were recorded if present. The observer was blind to treatment allocation but was informed about the histologic evaluation.

Results: The inflammatory reaction to the dentin/sealer was similar for all 3 groups – they had mild to moderate inflammation, with no significant statistical difference between the groups. Both dentin/sealer groups showed areas of necrosis next to the sealer at 7 days whereas the dentin only group did not. At 30 days, all 3 groups had only a thin fibrous capsule next to the sealer with no necrosis. The Sealapex™ group was the only group that showed evidence of calcification next to the sealer – both at 7 and 30 days.

Discussion: One of the methods used to test biocompatibility of endodontic materials is subcutaneous implantation in rats. When a sealer releases calcium and hydroxyl in connective tissue over time, the increase in pH is bactericidal, anti-osteoclastic, and it encourages mineralization of the tissues including mineralization of the apical foramen, called “biologic sealing”, which is desirable if we want to promote healing around the apex. Acroseal seems to be inferior to Sealapex™ since it did not stimulates mineralization in vivo.
Title: Fracture resistance of teeth restored with different post systems: in vitro study

Author: Ahed M. AL-Wahadni et al.


Reviewer: Michael Sha, DMD

Purpose: To investigate in vitro the fracture resistance and the mode of failure of teeth restored with different prefabricated post systems including glass fiber, carbon fiber, and Radix titanium posts.

Materials and Methods:

- Thirty single-rooted anterior teeth with similar dimensions were used
- The teeth were accessed, enlarger to MAF size 40, then sectioned 2mm coronal to the enamelocemental junction and embedded in die stone.
- A 10mm post space is prepared in each tooth. Teeth were randomly chosen to be restored with either glass fiber, carbon fiber, or Radix prefabricated titanium metal post. Adhesive resin cement was used and a hybrid composite core was placed.
- Each tooth was loaded on the universal testing machine. The compressive load is applied at 10mm/min crosshead speed at 130° from horizontal plane at the coronal 1/3 of the buccal surface.
- The force at failure and the mode of failure (core only, root only, or root and core) were recorded.

Results:

- Teeth restored with Radix titanium post has the highest fracture load (571.6N), which had a statistically significant difference with either the glass fiber posts (393N) or the carbon fiber posts (420N).
- Failure mode: Combined core and root fracture is most common (70%), with 16.67% for root only and 13.33% for core only.

Discussion:

- Continuous loading was used in this study, instead of the more realistic cyclic loading.
- Radix titanium post has a high flexural strength and high modulus of elasticity, which allows the post to withstand a lot of stress before transferring the stress to the tooth. Glass and carbon fiber posts have the same rigidity and transfer the loading stress to the tooth sooner.
- There were conflicting results on the stiffness of the post and its stress distribution or failure rate due to various experimental conditions.
- Radix and glass fiber posts showed mostly combined core and root failures due to their high bending resistance.

Conclusion: Teeth restored with Radix titanium posts had the highest resistance to fracture when compared to fiber and glass posts. Most of the fractures made the tooth non-restorable (core and root fracture, root only fracture).
Title: Single vs. multiple visits for endodontic treatment of permanent teeth: a cochrane systematic review

Author: Figini et al

Journal: JOE, vol 34, no 9, p. 1041 September 2008

Reviewed by: Kathy Le, DDS

Purpose: To investigate whether the effectiveness and frequency of short-term and long-term complications are different when RCT is completed in one or multiple visits.

Materials and Methods:

- 12 studies were included in the review (see table 2 for main characteristics of the included studies)
- All studies compared RCT performed in a single visit w/ that performed in multiple visits. In the multiple visits, the majority of authors completed the tx in 2 visits.
- All studies enrolled subjects w/ teeth w/ fully formed apex and w/o internal resorption.

Results/ Discussion:

- no study investigating tooth extraction due to endo problems
- in 5 studies, single visit appeared to be slightly more effective than multiple visits for radiographic resolution of apical periodontitis, although the difference was not statistically significant.
- no statistical difference in post-op discomfort level and post-op swelling/flare-up between the 2 groups, although less common after multiple visits
- analgesic use was significantly more common in pts undergoing single visit because during single visit the working time is longer, causing a more severe inflammatory response.
- sinus tract formation was not investigated.

Conclusion: Therefore, the effectiveness of single-visit and multiple visits RCT is not substantially different. Most short-term and long-term complications are similar in both.
Title: Radiographic investigation of location and angulation of curvatures in human maxillary incisors

Author: Willershausen et al.

Journal: JOE, vol 34, No. 9, September 2008

Reviewer: Felicitas Wibowo, DMD

Purpose: To evaluate the degree and location of root canal curvatures of human maxillary incisors.

Materials and Methods:

- 286 extracted human maxillary central and lateral incisors
- Exclusion criteria were the following:
  1. teeth with a nondefinable CEJ or apex
  2. endodontically treated teeth
  3. a non-definable clinical crown and/or root
  4. teeth with root caries, crowns or extensive fillings
  5. type II and type IV root canal configurations
  6. maxillary incisors with two root canals:  Type II - 2 separate canals leave the pulp chamber and join short of the apex to form 1 canal. Type IV- 2 separate and distinct canals extend from the pulp chamber to the apex.
- Teeth were fixed in a special device and digitally radiographed, at pre-established distances, with parallel technique.
- A horizontal line between mesial and distal CEJ served as coronal reference level.
- The length of straight line between CEJ to first curvature was recorded. The corresponding angle was determined as the angle between distance I (CEJ to 1st curvature) and distance II (2nd curvature to radiographic apex/ 3rd curvature). [Figure 1].
- Data were analyzed with statistical package SPSS and p value were calculated using Wilcoxon Mann-Whitney test.

Results:

- Mean distance between CEJ and 1st curvature of central maxillary incisors was 10.34mm (SD ± 2.7) and that of lateral incisors was 11.0mm (SD ± 3.0).
- Most of central incisors and all of lateral incisors exhibited curvatures.
- Mean angle of 1st curvature for central maxillary incisors was 7.8º (SD ± 4.8º) and that of lateral incisors was 10.8º (SD ± 7.2º).
- Statistical differences in canal curvature location and angle values were observed between central and lateral maxillary incisors, but there was no statistical difference between right and left side.

Discussion: Morphology of root canal curvature still remains one of the most important factors for successful endodontic treatment as well as minimizing failure during post insertion.
Title: The effect of mineral trioxide aggregate on the mineralization ability of rat dental pulp cells: an in vitro study

Authors: Yasuda Y et al

Journal: JOE, vol. 34, no. 9, 1057, Sep 2008

Reviewer: Ramya Ramamurthy, DDS

Purpose: To investigate the effect of mineral trioxide aggregate (MTA) on cell viability and mineralization ability of rat dental pulp cells.

Materials and Methods: The pulp capping materials, such as MTA, Dycal (Dentsply Caulk, Milford, DE), and Superbond C&B (SB; Sun Medical, Shiga, Japan) were placed on transwell inserts and cultured with rat dental pulp cells.

Results:

- MTA and SB exhibited no cytotoxicity, whereas almost all cells had died after 72 hours of culture with Dycal.
- MTA significantly stimulated mineralization by 60% compared with the control. MTA and Dycal significantly upregulated by two-fold the level of bone morphogenetic protein (BMP)-2 messenger RNA expression compared with the control. Furthermore, MTA increased BMP-2 protein production by about 40%, whereas Dycal significantly reduced it. Although MTA and Dycal increased the concentration of extracellular calcium by approximately 0.4 mmol/L, SB had no effect.

Conclusions: BMP-2 may play an important role in mineralization stimulated by MTA.
Title: The influence of mineral trioxide aggregate on adaptive immune responses to endodontic pathogens in mice

Author: ReZende et al

Journal: JOE, vol 34, No 9, 1066, September 2008

Reviewer: Kristina Shagramanova, DDS

Purpose: To assess the influence of mineral trioxide aggregate (MTA) on (1) the induction of in-vivo IgG antibody response to *Fusobacterium nucleatum*, and (2) the cytokine production pattern of memory T-cells in response to two bacteria commonly found in periradicular lesions, *F. nucleatum* or *P. anaerobius*.

Background Information:
- Adaptive immune response - includes Antibody (Ab) production and cell-mediated immune response; considered to be the host’s protective means against bacterial infection.
- The same group of researchers previously showed that MTA does not affect the antibacterial activity of macrophages.
- Now, the research group wanted to find out if MTA exerts any effects on adaptive immune responses, i.e B-cells and T-cells
- Why MTA?
  - Aluminum salts are known to be potent adjuvants for immunization with protein antigens. Aluminum hydroxide is most commonly used, and is included as an adjuvant in some vaccines b/c it contributes to the induction of good Ab response. However, it has little capacity to stimulate cellular immune responses, which are important for protection against many pathogens.
  - MTA is composed of aluminum oxide as well as other mineral components, and it has been reported that aluminum in cation form (Al 3+) is detected in distilled water incubated w/MTA. Therefore, it was hypothesized that aluminum cation can be released from MTA under physiologic conditions, which could augment host protective body responses while suppressing tissue destructive cellular immune responses b/c of its adjuvant effects by the presence of aluminum oxide.

Materials and Methods: Six-eight wk old male mice were immunized with heat-killed bacteria: 1) *Fusobacterium nucleatum* (F.n) – Gram-negative endo pathogen and 2) *Peptostreptococcus aerobius* (P.a) – Gram-positive endo pathogen

- **Determination of IgG Ab response** → immunization mixtures included:
  - heat-killed *F.n* +
    - a) PBS       b) Freund’s adjuvant   c) Aluminum Hydroxide adjuvant   d) MTA
  - IgG antibody response present in the blood serum was measured by ELISA
- **Determination of antigen specific T-cell response** → immunization was done w/heat-killed *F.n* and *P.a*
  - animals were sacrificed, and mononuclear lymphocytes (T-cells) were isolated from the cervical and auxillary lymph nodes
  - these T-cells were incubated with bacterial antigen, and their proliferation in response to each bacterial antigen was noted. Then, these in-vitro primed memory T-cells were re-stimulated with or w/o MTA in the presence of *F.n* and *P.a*, and their proliferation response in terms of cytokine production was determined

Results:
- Adjuvant property of MTA: immunization w/heat-killed *F.n* in MTA upregulated IgG Ab to *F.n* compared to group immunized w/*F.n* and PBS (control). This suggests that MTA possesses adjuvant effects in the induction of IgG Ab response against *F.n*
- Cytotoxicity of MTA to lymphocytes: presence of MTA did not affect the cell death of lymphocytes, indicating that MTA is not cytotoxic to lymphocytes
- Effect of MTA on memory T-cells (Tm)
  - exposure of Tm cells to MTA suppressed the antigen-specific proliferation of both *F.n* and *P.a*-reactive Tm cells
  - MTA exposure also inhibited IL-4 and IFN-γ production (T-cell growth factors) and did not affect the expression of RANKL (bone destructive cytokine), TNF-α (inflammatory cytokine), and IL-10 (anti-inflammatory cytokine) by antigen-stimulated Tm cell.

Discussion:
- MTA up-regulates the IgG Ab response
MTA suppresses proliferation of \textit{F.n}-reactive and \textit{P.a}-reactive Tm cells, and reduced their expression of cytokines, IL-4 and IFN-\gamma.

MTA use results in little or no alteration of other cytokine expression (RANKL, TNF-\alpha, and IL-10)

\textbf{Conclusions:} MTA’s influence on adaptive immune response still favors the host in the context of periradicular lesion caused by bacterial infection

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**Title:** \textit{In Vitro} cytotoxicity evaluation of a self-adhesive, methacrylate resin-based root canal sealer.

**Author:** Pinna L. et al

**Journal:** JOE vol. 34, no. 9, 1085; September 2008

**Reviewed by:** Ali Sarraf, DMD

**Purpose:** To assess the \textit{in vitro} cytotoxicity of MetaSEAL™ (a self-adhesive, dual curable methacrylate resin-based sealer), over longer time periods and compare the results with AH Plus™ (an epoxy resin based sealer) and Pulp Canal Sealer™ (zinc oxide-eugenol based sealer).

**Materials and Methods:**

- MetaSeal™, AH plus™, and Pulp Canal Sealer™ mixed according to manufactures recommendation.
- Each material was packed into six pre-sterilized Teflon molds and covered on both sides with pre-sterilized Mylar sheets.
- The molds were covered with a glass slab on each side and clamped to spread the sealer.
- MetaSEAL™ was polymerized through the glass slab for 2min on each side using a curing light.
- Specimens were allowed to set for 72hrs at 37°C and 100% humidity.
- Materials were tested for cytotoxicity using ROS 17/28 rat osteoblast-like cell line.
- Cytotoxicity of the three sealers was assessed after the initial 72-hour setting period and for 5 succeeding weeks.
- Cell mitochondrial activity was determined by estimating their succinate dehydrogenase activity.

**Results/Discussion:**

- MetaSEAL™: remained severely cytotoxic at wk 1 and mildly toxic at wk 2 & 3. and noncytotoxic after wk 3
- AH Plus™: Moderately cytotoxic at wk 1, mildly cytotoxic at wk 2 & 3. Not cytotoxic after wk 3
- Pulp Canal Sealer™: Severely cytotoxic and did not change during the 5 wk period.
- Most Cytotoxicity to Least: Pulp Canal Sealer™ >>>MetaSEAL™ > AH Plus™
- In clinical Scenario:

  MetaSEAL™: extrusion of the methacrylate resin-based sealer through the periapex would create an uncured surface layer because the sealer is polymerized under aerobic conditions
  AH Plus™: toxicity is derived from the epoxy resin component, which is released after setting.
  Pulp Canal Sealer™: toxicity due to continuous elution of eugenol
Title: Factors affecting temperature rise on the external root surface during ultrasonic retrieval of intracanal separated files

Author: Madarati et. al.

Journal: JOE, Vol. 34, Num. 9, p. 1089, Sept. 2008

Reviewer: Kevin K. Sameti D.D.S.

Purpose: To investigate the effect of dentin thickness, power setting, tip type, and tip size on temperature rise (TR) on the external root surface during ultrasonic removal of separated endodontic files without coolant.

Materials and Methods: Fifty lower incisors were cleaned and decoronated to a length of 10 mm. A 4 mm rotary file was broken in each canal 2.5 mm from the coronal access. Using modified GG a staging-platform was created. The whole assembly temperature was raised to about 37°centigrade. Teeth were divided in 5 equal groups in a way that there was no significant difference in their average coronal dimensions. CPR ultrasonic tips (Obtura-Spartan) were used to trephine a gutter of dentin around the file, using 12 x magnifications under microscope. The five groups were as follows: CPR2, CPR5 and CPR6 at power setting (PW) 1 and CPR5 at PW 2.5 and 5. The TR on the external surface of teeth was observed at three different sites: two at mesiodistal and buccolingual surfaces adjacent to the most coronal aspect of the file and the third adjacent to the most apical aspect of the file. Temperature changes were recorded continuously every second but were inspected at 30 second intervals up to 120 seconds. A total of 600 measurements were analyzed.

Results:

- The highest mean TR was recorded at the buccolingual root surface (11.2°C) followed by that at the mesiodistal and the more apical site root surfaces (7.1° and 2.7°C, respectively)
- At power setting 1, CPR5 tips produced a significantly higher TR (11.7°C) compared with CPR2 (9.6°C) and CPR6 (4.8°C) tips at 120 seconds.
- Power setting 5 induced a significantly higher TR (17.5°C) than power settings 1 (11.7°C) and 2.5 (12.7°C) at 120 seconds.
- There was no significant difference between power setting 1 and power setting 2.5.

Discussion/Conclusion:

- A 10°C TR has been reported as a threshold beyond which bone injury may occur.
- TR on the external root surface was found to be a function of root canal wall-thickness, ultrasonic tip type, power setting, and application time.
- Although CPR6 tips can be safely used up to 120 seconds, CPR2 and CPR5 tips can be used up to 90 and 60 seconds, respectively, when activated at power setting 1.
- Power setting 5 is not recommended for ultrasonic removal of separated files.
Title: Dye extraction results on bacterial leakproof root fillings

Author: Gustavo De-Deus et al.


Reviewed by: Aneel Belani, DDS

Purpose: To assess and compare the sensitivity and sealability of bacterial leakage and dye extraction studies. The model used for this study was the comparison of lateral condensation, System B, and Thermafil® as obturation techniques.

Materials and Methods:

- Eighty extracted mandibular incisors were accessed and instrumented using .06 taper K3 NiTi rotary files creating an apical diameter of .25mm at the apex.

- The teeth were obturated using lateral condensation with a 25 MAC, system B technique, and a size 25 Thermafil® plastic obturator.

- The teeth were placed in a two chamber apparatus, with the coronal access exposed to human saliva for 100 days.

- The bacterial leakproof specimens were determined using turbidity test in BHI broth each day.

- 10 leakproof specimens were randomly selected from each group, washed, and placed in 5ml 2% methylene blue for 48 hrs. (negative control was non-accessed teeth and positive control was accessed non-obturated)

- Teeth were placed in Nitric acid 3 days for demineralization, and analyzed for dye leakage through UV spectrophotometer.

Results: The controls showed no leakage and complete leakage in the negative and positive controls respectively. No significant difference was viewed between the groups. Bacterial leakproof specimens had methylene blue leakage in every instance.

Conclusion: All root canal filling techniques had similar results in bacterial leakage and dye leakage. Bacterial leakproof models showed dye leakage, suggesting that filling materials are more permeable to methylene blue than bacteria. Dye leakage studies may not yet be of clinical significance, and need to be improved to mimic intraoral conditions better.
Purpose: To develop a carbonate-containing apatite/collagen (CAp/col) that is applicable to defects at the apical region of root canals.

Materials and Methods:

- Construction of CAp/col composite done with the use of a non-antigenic collagen (atelocollagen). Atelocollagen reconstituted with the addition of an equiv amount of triethanolamine hydrochloride buffer sol and subsequently cross-linked in 0.1% dimethylsuberimidate dihydrochloride in the presence of 0.01% alkaline phosphatase and 0.01% egg-yolk phosvitin at pH 8 for 6 days. Sample washed with distilled water and placed into calcium β-glycerophosphate solution for 20 hrs. After each change of sol, sample centrifuged for 10 minutes, constituting one calcification cycle. Cycle was repeated 1-15 days to explore the time needed to obtain a composite with apatite content suitable for an apical barrier.
- To analyze calcification rate, Ap content of composite of 1-15 days of reaction was determined thermogravimetrically (wt%).
- The formed CAp/col composite was characterized on its Ca/PO4 ratio.
- The composite to saline ratio suitable to set into root canal was explored based on ease of manipulation and washout resistance.
- 10 human single rooted molars were used; mixture of CAp/col and saline placed from apex to height of 2mm. Remainder of RC filled with GG and SC sealer by lateral con.
- Root soaked in India Ink for 48 hrs and height of stained region in CAp/col measured.

Results and Conclusions:

- Calcification of collagen proceeded rapidly in the first 2 days: 30 wt% at 12 hrs, 60 wt% at 1 day and 70 wt% at 2 days. At 15 days amount of apatite was 80 wt%.(Fig 1)
- X-ray diffraction and FT-IR spectra of the composites were analyzed at different time intervals (Figs 3 & 4), depicting times when mineralization of collagen occurred.
- After 48 hrs of soaking in India Ink, the length of the Ap/col penetrated with the ink was 1.2±0.4mm from the apex.
- The authors allude to inorganic MTA as a promising root-end filling material, which does not contain collagen, however, the study does not compare the 2 products or make conclusions on which is superior.
Title: A Comparison of Five Radiographic Systems to D-Speed Film in the Detection of Artificial Bone Lesions

Author: D.L. Hadley et al., 2008

Journal: JOE Vol 34, No 9, p 1111, September 2008

Reviewer: Sorin Purtuc, DMD

Purpose: To evaluate and compare 3 direct digital sensors, a phosphor plate system, and an F-speed film to the gold standard D-speed film in the detection of artificial bone lesions prepared in mandible bone sections.

Materials and Methods:

- 7 posterior human mandible sections were used. The bone was stripped of soft tissue, dried, and luted to a plastic base. The bone was CT scanned to measure the thickness of buccal and lingual cortical plates.
- Simulated bone lesions were created by removing varying depths of cortical bone using a no. 560 low-speed bur. A positive control consisted of a through and through cut. The negative control was a sign made on the mandible with a marker but without an actual cut made.
- All images were made using a Gendex GX770™ machine, preset at 70kVp, 7mA.
- The exposure time for each film was made according to manufacturer’s recommendations, fine-tuning it to give the best contrast for each individual film.
- The digital films were viewed on 15-inch laptop display, using manufacturer’s software. Films were viewed on a standard view box.
- Information identifying specific digital systems, or film labels was concealed to reduce bias.
- Images were evaluated by 9 examiners that had from 5 to 37 years experience; they consisted of 5 general practitioners and 4 endodontists.
- The responses from practitioners were modeled using repeated-measures logistic regression procedure.

Results:

- The probability of lesion detection was found to be a mean of 68.7%.
- Kodak filtered images had the highest probability (78.6%), next was Schick filtered image (76.6%), then OpTime phosphor plate unfiltered image (74.6%), Schick unfiltered image (73.8%), Dexis filtered image (72.3%), Dexis unfiltered image (69.8%), Kodak unfiltered image (69.4%), F-speed film (65.3%), and D-speed film (65.2%).
- Digital films were significantly better at lesion detection than D-speed film.
- Schick was the only digital system that had both filtered and unfiltered images significantly better than D-speed film.
Accessory root formation is most common in mandibular canine, premolar and molar (especially 3rd molar) teeth. These anomalies are rarely seen in mandibular and maxillary incisor teeth. The etiology of the anomaly is unknown. But it may be due to an ingrowth of Hertwig’s Root Sheath.

25 yo man with Hx of recurrent swelling of soft tissues of the lateral incisor region. Sinus tract noted on facial attached gingiva overlying the apex of the maxillary lateral incisor (#10). On the day of Tx, the patient had no swelling or pain. #10 did not respond to pulp tests.

PA radiograph revealed a separate accessory root, a large radiolucent area around the accessory root, and an expansion of the periapical periodontal space. Perio probing revealed a 7mm pocket on the distolinguinal aspect of #10.

Dx #10 was pulp necrosis with chronic periradicular periodontitis

Non-surgical RCT was performed. No canal orifice of the accessory root could be identified. Calcium hydroxide was used as intracanal medicament for one week.

After one week of Ca(OH)2 Tx, patient returned with resolution of all signs and symptoms. RCT was completed at this time.

Due to the inability to Tx a canal in the accessory root, and in order to correct the periodontal defect, surgical intervention was made one week after completion of the non-surgical RCT.

The accessory root was amputated, the inflammatory lesion was removed by curettage, and root planing was performed. Since a foramen corresponding to the accessory root was not found, no root filling was performed. Bony defect was filled using autogenous bone harvested from the maxillary tuberosity. The patient was perscribed amoxicillin plus clavulanate (625mg bid for 7 days).

The healing period was uneventful. One year later, no sinus tract was present but there was evidence of gingival recession on the distal aspect of #10. PA radiograph revealed almost complete healing of the lesion around the main root. Perio probing revealed depths of 3 to 4mm. All findings were consistent with Tx success.
Title: Apical actinomycosis as a continuum of intraradicular and extraradicular infection: case report and critical review on its involvement with treatment failure

Author: Ricucci, D et al.


Reviewer: Michael Sha, DMD

Purpose: A case report of extraradicular actinomycosis that formed a continuum with intraradicular infection.

Introduction:

- Apical periodontitis lesions are usually free of microorganisms, but sometimes bacteria can invade the inflamed periradicular tissue and establish an infection (ex. Acute apical abscess)
- In recalcitrant apical periodontitis lesions, cohesive actinomycotic colonies can be found in the body of extraradicular lesion.
- Extraradicular infection can be dependent on or independent of the intraradicular infection. Independent extraradicular infections are the ones that persist after successful nonsurgical RCT. Ex. Apical Actinomycosis caused by Actinomyces species or Propionibacterium propionicum.

Case:

- 32 y.o. woman presented with spontaneous pain and sinus tract related to tooth #7. #7 has no response to thermal or electric pulp test, and large PARL is evident on x-ray.
- Root canal therapy completed with 35 days of inter-appointment calcium hydroxide medication.
- Pt returned 1 year and 8 months later with recurrent sinus tract and increased PARL size.
- Periradicular surgery with apicoectomy preformed, 2 masses of sulfur granules found within apical lesion.
- Microscopically the sulfur granules contained central mass of intertwined branching bacterial filament. PMNs were found at the periphery of the colonies. Dense bacterial biofilm also found in apical third of root canal sections.

Discussion/Conclusion:

- Clusters of actinomycosis colonies usually appear yellowish in color, thus named sulfur granules. The granules provide the bacteria with protection from immune response.
- Diagnosis of apical actinomycosis requires histological exam of excised specimen.
- From the few studies existed, the incidence reported for apical actinomycosis is 2-4% out of all apical periodontitis.
- The case reported here is a good example that the actinomycosis colonies observed in periradicular biopsy specimens are an extension of a persistent intraradicular infection.
- Apical actinomycosis have been treated successfully with either periradicular surgery (resection of root tip and the extraradicular component) or extraction, there is no need for prolonged use of antibiotics.
Title: Mineral trioxide aggregate as repair material for furcal perforation: case series

Author: Pace et al.

Journal: JOE, vol. 34, no. 9, 1130, September 2008

Reviewer: Felicitas Wibowo, DMD

Purpose: To present the 5-year follow-up results of 10 cases treated for furcal perforation repaired with Mineral trioxide aggregate (MTA) without internal biocompatible matrices.

Material and Method:

- 10 adult patients, ages between 25-35 years old, were treated for perforations of furcal area with the absence of pathologic periodontal probing. Time between creation of perforation and repair ranged from 1 to 6 months. Size of all perforations was <2mm. Furcal and periapical radiolucency lesions were present in all teeth.
- All perforation sites were cleaned with 5% NaOCl, 10% EDTA and ultrasonic tips and sealed with MTA without internal matrix.
- Hardening of MTA was evaluated after 72 hours before finishing the root canal therapy.
- Coronal restoration was performed 1 week later.
- Follow-ups were done at 6 months, 1 year, 2 years and 5 years. Clinical criteria for healing were absence of a periodontal defect in area of perforation, absence of pain, absence of swelling and fistula. Radiographic criteria for healing were absence of radiolucency adjacent to repair site and absence of periradicular lesions.

Results:

- At 6-month recall, reduction of PARL was shown in all teeth.
- At 1-year follow-up, persistence of furcal and periapical lesion was shown in only 1 case. In this case, time elapsed from creation of perforation to repair was 6 months.
- Starting from follow-up at 6 months to end of 5-year period, 9 of 10 cases were clinically healed. No episodes of swelling or pain and perio probing depth were less than 4mm in all teeth. Absence of PARL was observed at 1, 2 and 5-years follow-up.

Discussion and Conclusion:
A timely sealing of furcal perforation is essential due to proximity of the defect to oral environment. Immediate repair reduces possibility of bacterial contamination. MTA provides a good short-term, i.e. 5 years, in sealing small, fresh furcal root perforation.
**Title:** An *ex vivo* evaluation of a gutta-percha filling technique when used with two endodontic sealers: analysis of the filling of main and lateral canals

**Author:** Venturi

**Journal:** JOE, Volume 34, Number 9, September 2008

**Reviewer:** Jay Gupana, DMD

**Purpose:** To evaluate the quality of filling provided by vertical compaction with the apical backfilling technique when used with Pulp Canal Sealer (PCS)-Extended Working Time (EWT)™ or AH Plus® both in main root canals and in lateral canals.

**Material and Method:**

- Pairs of ext. teeth with roots with lengths 12-15mm were randomly assigned to either group A (PCS™, ZOE based) and group B (AH Plus®, epoxy resin based) – each group included 12 max and 13 mand molars with 75 canals similar in length
- Teeth were accessed and WL established to an accuracy of .25mm with 6 K-file
- Hedstrom files #8-10 followed by #10 M Two rotating instrument used to instrument to WL
- #10 M Two used to enlarge coronal and middle third of each root followed by #15-20 Hedstrom files, Profile .04 taper rotary files #15-40 were then used to complete preparation of the canal, canals were then irrigated with 5% sodium hypochlorite and lubricated with RC-prep, followed by 15 min of irrigation w/ 17% EDTA to remove smear layer
- Vertical compaction done with .04 GT gp cone cut 1mm short of WL, and coated with PCS™ (group A) or AH Plus® (group B), GP removed with GG size 1 leaving 3-4mm of GT cone which was pushed 1 mm apically, Master gutta percha cone was pushed against apical plug
- Access sealed with Ketac and teeth exposed to a demineralizing solution for 14 days and rinsed

**Results/Discussion:**

- Both groups in which the most apical 4mm of main canals where gp was compacted, lesser voids were found than in middle-coronal thirds backfilled with thermo mechanical compaction
- AH Plus® filling of main canals were more precise and exhibited lesser voids as compared to PCS™
- AH Plus® also showed better filling of lateral canals than PCS™
- For both cements filling of lateral canals were better at the coronal third as compared to the middle third, and better filling at middle third as compared to the apical third, due to the decreasing size of lateral canals apically
- The differences in physical properties of sealers impact the quality of filling of lateral canals and further research should be done looking at the responses of different sealers in realistic conditions