Title: Biocompatibility of various root canal filling materials ex vivo

Author: Scotti, et al.

Journal: International Endodontic Journal

Reviewer: Adam Bergman, DMD

Purpose: To evaluate the biocompatibility of resin-based endodontic filler (RealSeal™) using an indirect cytotoxicity test.

Materials and Methods:

- RealSeal™ (resin-based), Obtura (gutta-percha) and Permadyne ™ Penta ™ L (polyether) pellets were incubated in 5 mL of culture medium for 24, 48 and 72 hours.
- At the end of the incubation period, the eluates of these materials were collected and enriched with fetal calf serum (FCS).
- Human gingival fibroblasts (HGFs) were cultured and plated. These cells were then exposed to the following (for 24 hours):
  - 1 mL of culture medium with 10% FCS (control)
  - 1 mL of diluted (50%) or undiluted (100%) extracts
- Each concentration was tested in quadruplicate wells, as were the controls.
- At the end of the treatment, cellular viability was estimated by the MTT assay. MTT is a water-soluble tetrazolium dye which will produce an insoluble purple formazan product in the presence of live cells. The amount of formazan generated is directly proportional to the number of viable cells present.
- After the control and the extracts were incubated with the HGFs for 24 hours, the medium was removed. Growth medium, along with MTT, were then added to the cultures.
- After 3 hours of incubation, DMSO was added to dissolve the purple crystals of formazan. The colored solution was then analyzed with a spectrophotometer to determine the optical density (which directly correlates with the number of viable cells).
- Three statistical analyses were then performed.

Results and Conclusions:

- Eluates obtained after 24 hours of incubation with the resin filler did not reduce cellular viability (compared to control). The gutta-percha eluates increased cellular viability. The undiluted polyether material was cytotoxic (82% decrease in cellular viability compared with control). See Fig.1 (indicates statistical significance).
- Eluates obtained after 48 hours of incubation with the resin filler increased cellular viability. Gutta-percha group was similar to control, and the polyether group was cytotoxic. See Fig.2.
- Eluates obtained after 72 hours with the resin increased cellular viability, as did the gutta-percha eluates. The polyether group was found to be cytotoxic. See Fig3.
- The results indicate that RealSeal™ resin-based endodontic filler was non-toxic in this model (similar to gutta-percha) and may be a suitable material for RCT.
Title: Periapical radiographs overestimate root canal wall thickness (RCWT) during post space preparation

Author: Souza, et al

Journal: IEJ 2008, 41, 658-663

Reviewed by: Kathy Le, DDS

Purpose: To determine the differences between radiographic and anatomic RCWT measurements before and after post preparation and to establish a pattern of radiographic distortion observed during post preparation

Materials and Methods:

- 20 single canal mand premolars exhibiting canal width ranging 0.8-1.2mm (mesial aspect) and 0.6-1.0mm (buccal aspect) at 5mm level from apex on the radiographs were selected.
- All teeth were decoronated at CEJ and the roots were embedded in resin using a Teflon muffle (fig 1).
- Embedded roots were then sectioned horizontally 1mm less than the crown height value (this level was selected as the point for radiographic and anatomic measurements)
- Canals were instrumented up to size 40, 1mm short of the canal terminus and step-back up to size 70.
- Post space was prepared as deep as crown length with Gates Glidden sizes 1 and 2 and refined with Peeso reamers sizes 2 and 3
- Digital photographs and radiographs were taken before preparation, after instrumentation, after use of Gates Glidden and Peeso reamers for comparison of RCWT
- Differences between radiographic and anatomic measurements were analyzed with t-tests.

Results/Conclusions:

- see Table 1
- RCWT measurements determined by radiographs were greater than the respective anatomic measurements by approximately 25% regardless of the clinical stage evaluated.
- This finding can be explained by the concavities on the proximal surfaces that reduce the distance between the outer and inner root surfaces, but do not decrease substantially the proximal root canal wall detected by periapical radiographs.
Title: Calcium hydroxide induced apexification with apical root development: a clinical case report

Author: J. Soares, et al


Reviewed by: Kristina Shagramanova, DDS

Purpose: To illustrate a case of induction of apical root development by calcium hydroxide in a tooth with pulp necrosis and periapical radiolucency (PARL)

Materials and Methods:

• 10 yo male patient w/Hx of dental trauma (about 2 yrs ago during a bicycle accident)
• CC: intense spontaneous pain associated with tooth #11
• Emergency tx was performed about 3 months ago
• Clinical exam: edema in the anterior facial region and alveolar mucosa; palpation +, percussion +; ice – no response, EPT – no response; composite resin restoration on the incisal 1/3 and temporary on the palatal aspect of #11.
• Radiographic exam: incomplete root formation, wide root canal space, thin and fragile dentinal walls, extensive foraminal opening w/PARL
• Dx: Acute dentoalveolar abscess on tooth #11
• Tx: 1. Emergency tx
  i) local: chemomechanical debridement/irrigation with consequent drainage of purulent exudate
  ii) systemic: NSAIDS (100 mg bid for 3 days) and Antibiotics (Amox 500 mg tid for 7 days)
  2. Apexification (1 week later)
  i)Further canal debridement w/copious 2.5% NaOCl; instrumentation w/K-files from size 60-120
  ii)WL=20 mm (coincides w/radiographic apex); Ca(OH)₂ paste applied w/lentulo spiral at low speed; cotton + temp
  iii)Ca(OH)₂ dressing was renewed monthly

Results:

• Radiographic exam at 120 days: reduced diameter of the foramen opening (checked by resistance to penetration of a size 120 file beyond WL)
• Following this, the pt only returned to change the RC dressing after 4 months
• Closure of root apex confirmed w/size #80 K-file
• PARL resolved
• Additional 5 mm of root apex developed
• Obturation: GP (molded, warm), Sealer 26, LC
• Pulp chamber restored with light-cured composite
• 3 yr follow up: no signs & symptoms and radiographic evidence of bone repair

Discussion: Apexification by means of chemo-mechanical debridement and maintenance of regularly renewed Ca(OH)₂ dressing is a justified alternative for the biological sealing of an extensive foramen opening, with concomitant repair of PA lesions and continued apical root development
Purpose: To evaluate the technical quality of root fillings performed by undergraduate students at a dental teaching centre in France

Materials and Methods:

- A random sample of 419 records of patients who received dental treatment at the dental service of the teaching Hospital, in Reims, France between 2005 and 2006 was investigated.
- Evaluation of root filled was based on radiographical criteria defined by the French National Health Service. The length of root fillings, the radiodensity and the presence of voids in the root filling or between root filling and root canal walls were recorded and scored.
- Chi-square analysis was used to determine statistically significant differences between the technical quality of root fillings and tooth type.

Results:

- Of the 304 teeth included in the study, 69% had an adequate length of root filling and 42.7% had a dense root filling without voids; only 30.3% of teeth fulfilled these criteria at the same time.
- The relationship between the technical quality of root fillings and tooth type was statistically significant (P < 0.001), the highest percentage of adequate root fillings occurred in single-rooted teeth (36.1%). The highest percentage of inadequate root fillings according to the criteria of root filling length and lateral adaptation was found in molar teeth (71.9%).

Conclusions: Overall, the technical quality of root fillings performed by undergraduate students was poor with only 30.1% having adequate quality. This suggests that the training course in endodontics has to be improved at both preclinical & clinical levels.
**Title:** Biofilm disruption by root canal irrigants and potential irrigants

**Author:** G. Bryce

**Journal:** IEJ. Volume 41, No. 9, p 814-815, Sep 2008.

**Reviewed by:** Aneel Belani, DDS

**Purpose:** To investigate the disruption and bactericidal effect of root canal irrigants on single and dual species biofilms.

**Materials and Methods:** Biofilms with single and dual species organisms were grown on membranes and exposed to common irrigants: NaOCl, EDTA, Corsodyl (chlorohex), iodine, and potential irrigants: SDS, CTAB, and Tween 80 (detergent found in MTAD). The number of viable and nonviable cells and the number attached and disrupted cells on the membranes were determined (stain and microscopy).

**Results:** Gram (-) organisms were more susceptible. Cell disruption occurred mostly in the first minute. NaOCl was most effective at biofilm disruption. Iodine was very effective at killing bacteria but not disruption of biofilm. CTAB and STS were both effective at killing and disruption.

**Conclusion:** Biofilm disruption and cell viability are influenced by type of species, co-association of species, and the irrigant used. NaOCl is reinforced as an irrigant of choice.

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**Title:** Differences in the confluence of mesial canals in mandibular molar teeth with three or four root canals.

**Author:** M. Furri

**Journal:** IEJ vol 41, 777-780; 2008

**Reviewed by:** Ali Sarraf, DMD

**Purpose:** To investigate the correlation between number of root canals and their confluence in mandibular molar teeth.

**Materials and Methods:** 936 mandibular first or second molars were used. 576 were to have primary treatment and 360 were to have retreatment. The straightest canals were instrumented. The appropriate size master gutta-percha point was placed in the canal and a small diameter file was gently inserted and removed at the working length, under the apex locator control. In all other canals the cone was taken out and inspected to check if notches were present indicating that a confluence was present.

**Results:**
- First molar: 3 canals 56.3% had confluence
  - 4 canals 33.8% had confluence
- Second molar: 3 canals 66.9% had confluence
  - 4 canals 40.9% had confluence

**Conclusion:** Confluences are more common in teeth with three root canals than in teeth with four root canals. Confluence is an important consideration because the file separation occur at those points.
Title: Characterization and chemical activity of portland cement and two experimental cements with potential for use in dentistry

Author: J. Camilleri


Reviewer: Kevin Sameti D.D.S

Purpose: To investigate the chemical composition and mechanism of hydration of two cement types with potential for use in dentistry compared with that of Portland cement.

Materials and Methods: The two cement types were: 1. CSA: calcium sulpho-aluminate cement. 2. CFA: calcium flouro-aluminate cement.

• The chemical composition of unset cements was determined using energy dispersive analysis by X-rays in the SEM.
• Phase analysis of set cements was performed after 1, 7, 28, and 56 days after curing using X-ray diffraction analysis.
• Chemical analysis of cement products in solution (leachate) was performed using ion chromatography.
• The pH of the cements was also recorded during setting for a period of 56 days, with the first reading being taken during mixing.
• The findings of this study were compared to the findings of white Portland cement (WPC) which were discovered in a previous study.
• The effect of addition of micro-silica to the cements was also tested. (The purpose of addition of micro-silica is to improve the mechanical properties of cements.)

Results:

• Tricalcium silicate was determined to be the main constituent of the cements.
• Analysis of WPC revealed a stable production of calcium hydroxide over the 56 days period whereas, CSA or CFA were shown not to be a reliable producer of calcium hydroxide. Addition of micro-silica did not have any effect in the production of Ca(OH)₂.
• Chemical analysis of the leachate revealed presence of calcium release which was stopped at day 56. WPC had a higher calcium output, with day 28 being at the peak.
• The pH changes ranged between 12 upon mixing and 10 during curing.

Discussion/Conclusion:

• The calcium hydroxide produced by WPC and MTA during hydration period accounts for biocompatibility of these products. The tested cements did not lead to production of Ca(OH)₂.
• Addition of micro-silica improved the mechanical properties of CSA and CFA without having any effect on the hydration reaction.
• Highest percentage of adequate root fillings occurred in single-rooted teeth (36.1%). The highest percentage of inadequate root fillings according to the criteria of root filling length and lateral adaptation was found in molar teeth (71.9%).
Title: A preliminary study on the technical feasibility and outcome of retrograde root canal treatment

Author: Jonasson, et al.


Reviewer: Adam Bergman, DMD

Purpose: To explore the technical feasibility of treating untreated abutment teeth with a surgical approach and to evaluate the potential of this technique to promote healing.

Materials and Methods:

- 21 teeth used - 18 max incisors, canines and premolars (PM); 3 mand incisors and canines. All teeth were abutments for bridgework and had periapical radiolucencies (PARL).
- Triangular flaps raised, bone covering lesion removed with round bur. Periradicular soft tissue removed with curettes.
- 2mm of root tip removed and canal was explored with #10 file. Files had handles removed and the files were held in hemostats. Instrumentation to size #35-40 with hedstrom files. Irrigation with 0.5% NaOCl.
- Canal dried with paper points and filled with AH plus sealer and thermoplasticized GP. A matched single cone of GP was inserted into the warm GP in the canal as the final step.
- If canal could not be found - 3mm retroprep created and filled with SuperEBA or MTA.
- Microscope was used in all cases.
- The part of the canal that was filled was judged on the radiograph and expressed as a proportion of the complete root length. Outcome in terms of healing was judged clinically and radiographically. Follow-up period was 6 to 48 months.

Results and Conclusions:

- In 14 cases it was possible to explore, clean and fill the canal. Complete healing was judged to be present in all teeth instrumented and filled in line with the protocol.
- In 2 two-rooted PM, one canal had complete instrumentation (buccal) and the other had ultrasonic root-end preparation (palatal). One of these cases failed after 1 year (relapse of fistula). Two of the five teeth in which only root-end ultrasonic preparations were performed were regarded as completely healed, and three cases showed uncertain healing. See Table 1.
- Surgical root canal treatment was found to be feasible in most incisors and canines and in some max two-rooted PM. Healing results from this retrospective analysis motivate a future randomized clinical trial.