Title: *Ex vivo* study of the efficiency of two techniques for the removal of MTA used as a root canal filling material

Author: Boutsioukis C. et al

Journal: JOE 34(10) October 2008, 1239-42

Reviewed by: Ali Sarraf, DMD

Purpose: The aim of this study was to evaluate *ex vivo* the efficiency of ultrasonics and rotary instrumentation for the removal of MTA root canal filling material.

Materials and Methods: Ninety-three freshly extracted human single-rooted teeth with no visible caries, fractures, or resorption. Teeth were instrumented with 40 H-file to WL. The teeth divided into 2 groups A & B:

- **Group A:** MTA was applied with a lentulo spiral then incrementally packed into the root canals and condensed up to the orifice.
- **Group B:** MTA was applied with a lentulo spiral. A size 40 .02 GP cone was placed to 2mm short of WL.

Setting of material was confirmed with endo explorer. From each group were further divided into 3 subgroups of 15 teeth each:

- **Subgroup 1:** filling material was removed by using a spreader-like tip long enough to reach WL on a portable ultrasonic device.
- **Subgroup 2:** filling materials were removed by using GT rotary instruments size 40 .04 and .06 taper (250rpm) and (1N/cm)
  - **Subgroup 3:** initially removed as described in subgroup 2 and subsequently as described in subgroup 1.

Crowns removed and roots were split and examined.

Results: Rotary instruments were unable to penetrate any of the root canals in Group A. When examining the efficacy of material removal in group B, there were significantly fewer remnants in the middle third of the teeth in subgroup B3 than B1. This is true for B3 compared to B2.

Conclusion: Use of rotary instruments appeared more efficient in removing filling materials in group B. However, from the experiment since B3 had the fewest remnants it suggests that ultrasonic is still required. The presence of a dense filling to the WL in subgroups A1 & B1 along the narrow apical canal diameter might account for a reduction in oscillation amplitude and limited performance of the tip, whereas the space provided by prior removal of GP might enhanced the effectiveness of the ultrasonic in subgroup B3.
Title: Comparison of effects of ProTaper, HeroShaper, and gates glidden burs on cervical dentin thickness and root canal volume by using multislice computed tomography

Author: Mahran, et al.


Reviewer: Adam Bergman, DMD

Purpose: The purpose of this study was to compare the effects of 3 different instruments on cervical dentin thickness and total amount of dentin removed during instrumentation in curved mesiobuccal canals of extracted mandibular first molars by using multislice computed tomography (MSCT).

Materials and Methods:

- 45 mand. first molars with curved mesial roots
- Teeth divided into 3 groups (15 teeth per group) according to the instrument used to prepare the MB canals.
  - **Group I** = ProTaper
  - **Group II** = HeroShaper
  - **Group III** = Gates Glidden Burs (GGB) sizes 3, 2, 1 for coronal enlargement in crown down manner followed by apical preparation with Flex-R hand file with balanced force technique.
- RC Prep used to coat each instrument. Irrigation with 2.5% NaOCl after each file. Canal patency maintained with 10 file.
- MAF size in all groups was size 30
- Mesial roots scanned before and after canal preparation with CT scanner at 50 micrometer intervals for a total of about 240 cross-section CT views per tooth.
- Mesial and distal (danger zone) dentin thicknesses were measured just below the MB orifice (coronal third of MB root).
- Volume of dentin removed from each canal was determined by subtracting the uninstrumented canal volume from the instrumented canal volume.

Results and Conclusions:

- Average distal dentin thickness for each group (in mm): 1.4 (I), 1.32 (II) and 1.28 (III)
- Average mesial dentin thickness for each group (in mm): 1.6 (I), 1.6 (II) and 1.5 (III)
- No statistically significant difference in dentin thickness between the three groups.
- Changes in distal dentin thickness after instrumentation were statistically significantly different between the groups with Group III showing the greatest percentage change and Group I showing the least percentage change. Mesial dentin thickness change was not statistically significantly different between the groups.
- Group I removed the highest mean volume of dentin and Group III removed the least (differences were statistically significant).
- Authors concluded that the ProTaper system is a safe NiTi rotary system for coronal pre-enlargement in curved root canals in regard to the danger zone because it removes significantly less dentin from this critical area, which decreases incidences of strip perforation occurrence. However, the authors also concluded that since the total volume of dentin removed from the canals was significantly greater with NiTi rotary systems, these systems may lead to problems that may affect the prognostic stability of the teeth.
Title: The effect of a resin-based sealer cement on micropunch shear strength of dentin

Author: Jainaen A, Palamara J, Messer H


Reviewed by: Kathy Le, DDS

Purpose: To investigate the role of tubules in biomechanical properties of dentin, as measured by micropunch shear strength (MPSS) and to evaluate the effect of resin infiltration on strength.

Materials and Methods: Maxillary and mandibular premolars with either a single root or two roots were selected. The crown of each tooth was removed 2mm apical to the CEJ. All samples were then prepared from the coronal third of the root. Some samples were cut transversely (to allow testing perpendicular to tubule orientation), while some were cut longitudinally (to allow testing parallel to tubule orientation).

- **Punch Shear Testing**: the prepared dentin slices were tested by using the micropunch shear apparatus according to locations (buccal and proximal), tubule directions (parallel and perpendicular), and areas (inner, middle, and outer dentin).
- **Resin-infiltrated vs. Sound Dentin**: the two-canal premolars, with one canal untreated (sound dentin) and the other obturated using epoxy resin-based sealer (AH plus) were compared. The effect of epoxy resin sealer on MPSS was analyzed using a paired t test.

Results:

- No statistically significant differences in MPSS between the two locations (buccal and proximal) or between the tubule orientations (perpendicular and parallel).
- The outer dentin had a significantly higher MPSS than the middle and inner dentin, and the middle dentin had a significantly higher MPSS than the inner dentin.
- No statistically significant differences in MPSS between resin-filled root inner dentin and sound dentin from the same tooth.

Conclusion: Using MPSS, no difference in punch shear strength of dentin was observed because of location or to tubule orientation. Only the area tested (inner, middle, or outer) was found to show a difference. Epoxy resin infiltration of tubules did not increase shear strength of dentin.
Title: Diabetes induces metabolic alterations in the dental pulp

Author: Mariana Ferreira et al.


Reviewer: Sorin Purtuc, DMD

Purpose: To show some of the changes that can occur in dental pulps as a result of diabetes.

Materials and Methods: Researchers used the rat model to study diabetic changes in pulps. Diabetes was induced using a single dose of streptozocin injection. Controls received only the vehicle (citrate buffer). Only rats whose blood glucose level was 300mg/dl or above were considered diabetic. Animals were sacrificed after 6 weeks. Maxillary and mandibular incisors dental pulps were removed, samples were homogenized in sodium phosphate buffer and centrifuged for 10 min at 3,020 g. The resulting supernatant was used in analysis. Free, total, and bound sialic acid concentrations were measured. Catalase activity and peroxidase activity were measured.

Results: Diabetic Rats as compared with normal rats showed significant decrease in weight by the end of the experiment. At the same time they showed increase consumption of liquids and food. The free, conjugated, and total sialic acid concentrations in dental pulps were significantly lower in the diabetic rats. A significant increase in catalase activity was observed in diabetic rats. There was no change in peroxidase activity.

Discussion: Diabetes Mellitus (DM) is a metabolic disease that has oral manifestations such as xerostomia, taste impairment, and sialosis, which can affect the progression of such diseases as dental caries, periodontal disease, and fungal infections. DM may be a modulation factor for endodontic infections as it impairs healing, decreases neutrophil migration, decreases leukocyte count, and increases the detection rate of anaerobic bacteria in dental pulps. DM also impairs microvasculature, and thus affects pulp tissues repair and nutrition.

DM seems also to affect the antioxidant defenses in the body. Hyperglycemia induces metabolic changes which result in overproduction of superoxide which is the cause of the micro- and macrovasculature complications. Overproduction of Reactive Oxygen Species (ROS) can also cause stimulation of matrix metalloprotease (MMP) which can cause damage to the connective tissue ground substance in dental pulp and elsewhere in the body.

The first defense against superoxide is the enzymatic system (ex: catalase, peroxidase). Second defense consists of the nonenzymatic system such as Vitamin E, C. Other compounds can act as H2O2 scavengers such as sialic acid. Sialic acid exists free form or as a terminal residue of oligosaccharide chains on different macromolecules in body fluids, mucosa, epithelium, cell membranes, and nervous system.

The reduction in sialic acid observed in DM pulps in this study could be explained by the pathophysiology of DM complications. Other studies also observed alterations in sialic acid metabolism in DM.

The increase in catalase activity observed in DM rats can be attributed to increase oxidative stress in the pulp. Other studies explored using catalase for controlling pulp inflammation and as a direct pulp cap agent. Also important, dental bleaching using peroxide can cause potentially more inflammation in DM patients.
Title: Efficacy of ProTaper retreatment system in root canals filled with gutta-percha and two endodontic sealers.

Authors: Marcus Vinícius Reis Só et al

Journal: J Endod. 2008 (34)10 1223-1225

Reviewer: Ramya Ramamurthy, DDS

Purpose: To evaluate comparatively the efficacy of the ProTaper Universal (Tulsa Dental, Tulsa, OK) rotary retreatment system and hand files for removal of filling material during root canal retreatment and the influence of the type of sealer on the presence of filling debris in the reinstrumented canals.

Materials and Methods:

- The canals of 60 palatal roots of first molars were obturated with gutta-percha and either a zinc oxide–eugenol–based or a resin-based sealer.
- The access cavities were sealed and the roots were stored in artificial saliva at 37°C for 3 months.
- Canals were re-instrumented: G1, EndoFill/hand files; G2, AH Plus/hand files; G3, EndoFill/ProTaper; G4, AH Plus/ProTaper.
- No Solvent was used.
- Roots were cleaved and examined with an optical microscope, and the amount of filling debris on canal walls was analyzed on digitized images.

Results:

- G3 presented significantly more filling debris than G1 in the cervical third ($P = .04$).
- In the middle third, G2, G3, and G4 showed more debris than G1 ($P = .03$).
- The techniques did not differ significantly ($P = .64$) in the apical third.

Conclusion:

- Debris was left in all canal thirds, regardless of the retreatment technique.
- The greatest differences between techniques and sealers were found in the middle third, with less amount of debris in canals obturated with EndoFill and reinstrumented with hand files.
- The techniques had similar cleaning efficacy in the apical third, regardless of the sealer.