Dr. Stephen and Dr. Justin Parente
Alpharetta Endodontics
Seattle Study Club
9/17/10

Thank you for coming to today's course. At the end of the day, hopefully you will have a better understanding of endodontic diagnosis and treatment. We will review basics, discuss the newest topics and techniques, and treatment plan complex cases.

# Diagnosis Overview:

## Pulpal

1. Normal Pulp
    a. Transient response to cold

2. Reversible Pulpitis
    a. Pulp is irritated, hypersensitive but responses are short duration
    b. Caries, fractures, defective restorations
    c. Dentin hypersensitivity

3. Irreversible pulpitis
    a. Symptomatic
        i. Intermittent, spontaneous pain
        ii. Prolonged/heightened thermal response
        iii. Sharp or dull, localized or referred
        iv. Minimal or no radiographic evidence except deep restoration or caries
    b. Asymptomatic
        i. Deep caries, large carious pulp exposures

4. Necrotic
    a. No response to thermal or electric testing

b. May have percussion or palpation responses as well as radiographic changes from associated periapical disease

5. Previously Initiated
    a. Pulpotomy/pulpectomy

6. Previously Treated

## Periapical

7. Periapical Periodontitis
    a. Symptomatic (previously acute)
        i. Positive percussion response
        ii. Possible ligament widening or PARL
    b. Asymptomatic (previously chronic)
        i. PARL w/o associated symptoms

8. Periapical Abscess
    a. Acute
        i. Positive to percussion, palpation
        ii. Varying degrees of mobility
        iii. Widened ligament or PARL
        iv. Swelling of mucobuccal fold and facial tissues
        v. Fever or lymphadenopathy
    b. Chronic
        i. Asymptomatic
        ii. Sinus tract or drainage through sulcus

# Treatment Overview

1. Diagnose
    a. Check Perio and Restorative prognosis
    b. Get Treatment Consent
2. Anesthesia
    a. B/P supraosseous for maxillary
    b. IANB + B supraosseous for mandibular
        i. For Irreversible Pulpitis lower molars test to cold and supplement as needed with:
            1. Intraosseous
            2. Intrapulpal
3. Rubber dam-always, NO exceptions.
    a. Use the appropriate clamp
    b. Split dam technique as needed
    c. Seal with oraseal or other caulking material as necessary
4. Access
    a. Know your anatomy
    b. Study *good* radiographs from different angles-ALWAYS take shift shots
    c. Start with a 4 round or 245
    d. Enlarge with a football diamond or EndoZ non-endcutting as necessary
    e. Remove all pulp horns
    f. Locate all canal orifices-again know your anatomy.
5. Instrumentation
    a. Explore canal orifices with #8 to patency estimated with radiograph
        i. Make sure there are no obstructions or surprises
        ii. If so, crown down delicately and short of curvatures
    b. Determine WL with EAL and verify radiographically

c. Never instrument a dry canal-always irrigate with NaOCl, CHX, or Saline as appropriate
d. Hand instrument to 20-25 with balanced force, watch-winding technique, vertical file only as needed.
e. GG2, sometimes 3 or OS1 to shape orifice.
f. Crown down if you need to, otherwise work 15(.04)-> final size and taper as appropriate for individual teeth. The apical size can be gaged with (.02) taper hand files to best determine your master apical file size.
g. Final Irrigation
    i. Ultrasonic agitation or Endovac
    ii. Smear layer removal with EDTA
h. Dry with paper points
i. Determine if CaOH2 placement is necessary
    i. Periapical Radiolucency
    ii. Sinus Tract
    iii. Swelling
    iv. Intracanal drainage
    v. More anatomy to clean at future visits

6. Obturation
    a. Start with clean, dry canals, well tapered, final sized with no debris within canal system
    b. Fit GP and verify radiographically and measured with a hand ruler.
    c. Coat sealer, lightly, fit.
    d. Sear off with System B
    e. Compact with warm vertical technique with System B followed by appropriate plugger
    f. Backfill with Obtura or similar tool
    g. Place coronal seal as appropriate
    h. Place temporary restoration
    i. ADJUST OCCLUSION

## Current Literature Abstracts

# Biofilms and Apical Periodontitis: Study of Prevalence and Association with Clinical and Histopathologic Findings


- Domenico Ricucci, MD, DDS
- José F. Siqueira Jr., DDS, MSc, PhD



## Abstract

### Introduction

This study evaluated the prevalence of bacterial biofilms in untreated and treated root canals of teeth evincing apical periodontitis. The associations of biofilms with clinical conditions, radiographic size, and the histopathologic type of apical periodontitis were also investigated.

### Methods

The material comprised biopsy specimens from 106 (64 untreated and 42 treated) roots of teeth with apical periodontitis. Specimens were obtained by apical surgery or extraction and were processed for histopathologic and histobacteriologic techniques.

### Results

Bacteria were found in all but one specimen. Overall, intraradicular biofilm arrangements were observed in the apical segment of 77% of the root canals (untreated canals: 80%; treated canals: 74%). Biofilms were also seen covering the walls of ramifications and isthmuses. Bacterial biofilms were visualized in 62% and 82% of the root canals of teeth with small and large radiographic lesions, respectively. All canals with very large lesions harbored intraradicular biofilms. Biofilms were significantly associated with epithelialized lesions (cysts and epithelialized granulomas or abscesses) ($p < 0.001$). The overall prevalence of biofilms in cysts, abscesses, and granulomas was 95%, 83%, and 69.5%, respectively. No correlation was found between biofilms and clinical symptoms or sinus tract presence ($p > 0.05$). Extraradicular biofilms were observed in only 6% of the cases.

### Conclusions

The overall findings are consistent with acceptable criteria to include apical periodontitis in the set of biofilm-induced diseases. Biofilm morphologic structure varied from case to case and no unique pattern for endodontic infections was identified. Biofilms are more likely to be present in association with longstanding pathologic processes, including large lesions and cysts

# Effects of four Ni-Ti preparation techniques on root canal geometry assessed by micro computed tomography.

Peters OA, Schönenberger K, Laib A.

## Abstract

**AIM:** The aim of this study was to compare the effects of four preparation techniques on canal volume and surface area using three-dimensionally reconstructed root canals in extracted human maxillary molars. In addition, micro CT data was used to describe morphometric parameters related to the four preparation techniques.

**METHODOLOGY:** A micro computed tomography scanner was used to analyse root canals in extracted maxillary molars. Specimens were scanned before and after canals were prepared using Ni-Ti - K-Files, Lightspeed instruments, ProFile.04 and GT rotary instruments. Differences in dentine volume removed, canal straightening, the proportion of unchanged area and canal transportation were calculated using specially developed software.

**RESULTS:** Instrumentation of canals increased volume and surface area. Prepared canals were significantly more rounded, had greater diameters and were straighter than unprepared canals. However, all instrumentation techniques left 35% or more of the canals' surface area unchanged. Whilst there were significant differences between the three canal types investigated, very few differences were found with respect to instrument types.

**CONCLUSIONS:** Within the limitations of the micro CT system, there were few differences between the four canal instrumentation techniques used. By contrast, a strong impact of variations of canal anatomy was demonstrated. Further studies with 3D-techniques are required to fully understand the biomechanical aspects of root canal preparation.

# The Self-adjusting File (SAF). Part 1: Respecting the Root Canal Anatomy—A New Concept of Endodontic Files and Its Implementation


- Zvi Metzger, DMD ,
- Ehud Teperovich, DMD
- Raviv Zary, DMD
- Raphaela Cohen, DMD ,
- Rafael Hof, MSc (Eng)



## Abstract

### Aim

To introduce a new concept, the self-adjusting file (SAF), and discuss its unique features compared with current rotary nickel-titanium file systems.

### The New Concept

The SAF file is hollow and designed as a thin cylindrical nickel-titanium lattice that adapts to the cross-section of the root canal. A single file is used throughout the procedure. It is inserted into a path initially prepared by a # 20 K-file and operated with a transline- (in-and-out) vibration. The resulting circumferential pressure allows the file's abrasive surface to gradually remove a thin uniform hard-tissue layer from the entire root canal surface, resulting in a canal with a similar cross-section but of larger dimensions. This holds also for canals with an oval or flat cross-section, which will be enlarged to a flat or oval cross-section of larger dimensions. The straightening of curved canals is also reduced because of the high pliability of the file and the absence of a rigid metal core. Thus, the original shape of the root canal is respected both longitudinally and in cross-section. The hollow SAF file is operated with a constant flow of irrigant that enters the full length of the canal and that is activated by the vibration and is replaced continuously throughout the procedure. This results in effective cleaning even at the cul de sac apical part of the canal. The SAF has high mechanical endurance; file separation does not occur; and mechanical failure, if it occurs, is limited to small tears in the latticework.

### Conclusion

The SAF represents a new step forward in endodontic file development that may overcome many of the shortcomings of current rotary nickel-titanium file systems.

# Efficacy of Different Irrigation and Activation Systems on the Penetration of Sodium Hypochlorite into Simulated Lateral Canals and up to Working Length: An *In Vitro* Study


- Cesar de Gregorio, DDS, MS ,
- Roberto Estevez, DDS
- Rafael Cisneros, DDS
- Avina Paranjpe, BDS, MS, MSD, PhD
- Nestor Cohenca, DDS



## Abstract

### Introduction

The removal of vital and necrotic pulp tissue, microorganisms, and their toxins is essential for endodontic success. However, the complex anatomy of the root canal system has limited our ability to debride it completely. Hence the purpose of this study was to evaluate the effect of currently used irrigation and activation systems on the penetration of sodium hypochlorite into simulated lateral canals and to working length in a closed system.

### Methods

One hundred single-rooted teeth were used in this study. A total of 600 simulated lateral canals were created, 6 in each tooth, with 2 lateral canals at 2, 4.5, and 6 mm of working length. To resemble the clinical situation, a closed system was created by coating each root with soft modeling wax. Roots were then randomly assigned to 4 experimental groups: group 1 (n = 20), Endoactivator (sonic activation); group 2 (n = 20), passive ultrasonic (PUI) activation; group 3 (n = 20), F file; group 4 (n = 20), apical negative pressure (ANP) irrigation; and control group 5 (n = 20), positive pressure irrigation. The samples were evaluated by direct observation of the images recorded under the dental operating microscope.

### Results

The results demonstrated that the ANP irrigation group was superior at reaching working length, and PUI was the most effective at lateral canal penetration.

### Conclusions

The ANP irrigation system demonstrated limited activation of the irrigant into lateral canals but reached the working length significantly more than the other groups tested. In contrast, PUI group demonstrated significantly more penetration of irrigant into lateral canals but not up to the working length.

## Root canal debridement using manual dynamic agitation or the EndoVac for final irrigation in a closed system and an open system

**Parente JM, Loushine RJ, Susin L, Gu L, Looney SW, Weller RN, Pashley DH, Tay FR.** Root canal debridement using manual dynamic agitation or the EndoVac for final irrigation in a closed system and an open system. *International Endodontic Journal*.

## Abstract

**Aim** This study examined canal debridement efficacy by testing the null hypothesis that there is no difference between a 'Closed' and an 'Open' system design in smear layer and debris removal using either manual dynamic agitation or the EndoVac for irrigant delivery.

**Methodology** Forty teeth were divided into four groups and submitted to a standardized instrumentation protocol. Final irrigation was performed with either manual dynamic agitation or the EndoVac on groups of teeth with or without a sealed apical foramen. Smear and debris scores were evaluated using SEM and analysed using Cochran–Mantel–Haenszel statistic.

**Results** The ability of manual dynamic agitation to remove smear layer and debris in a closed canal system was significantly less effective than in an open canal system and significantly less effective than the EndoVac ($P < 0.001$).

**Conclusion** The null hypothesis was rejected; the presence of a sealed apical foramen adversely affected debridement efficacy when using manual dynamic agitation but not the EndoVac. Apical negative pressure irrigation is an effective method to overcome the fluid dynamics challenges inherent in closed canal systems.