35 ENDODONTIC TIPS FROM 35 YEARS OF PRACTICE
PART 1
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Diagnosis
Anesthesia, Access, and Isolation
Instrumentation
Biochemical Irrigation
Obturation
Restoration
Post Operative

1. Medical History/ Dental History, Radiograph/ Digital Imaging
2. Percussion, Biting Pressure, Palpation
3. CO2 Ice, Endo Ice, H2O Ice
4. Digital EPT, Perio Probing, Transillumination,
5. Hot Temporary Stopping / Heat EOU,
   Hot / Cold Water Rinses, Anesthetic Test

Medical History
Dental History
Conclusions:
Both CBCT devices demonstrated poor accuracy in detecting simulated lesions smaller than 0.8 mm in diameter, fair to good accuracy when simulated lesion diameter was between 0.8–1.4 mm, and excellent accuracy when simulated lesions were larger than 1.4 mm in diameter. PA radiography, at best, demonstrated poor diagnostic accuracy for all simulated lesion sizes.

Conclusions:
CBCT evaluated 30.3% of the RCOs with radiographically adequate length as inadequate. When the RCOs radiographically terminated 0.5-1 mm short of the apex, the evaluation rated adequate for obturation length was comparatively reliable.

Conclusions
Under the conditions of this study, preoperative CBVT imaging provides additional information when compared with preoperative periapical radiographs, which may lead to treatment plan modifications in approximately 62% of the cases.
Response of Pulp Sensibility Test Is Strongly Influenced by Periodontal Attachment Loss and Gingival Recession

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Abstract

Introduction

To assess, in vivo, the influence of periodontal attachment loss and gingival recession on responses to pulp sensibility tests (PSTs) with cold stimuli in mandibular incisors in adult patients.

Methods

This cross-sectional study included 45 patients aged 30 to 60 years treated at a university dental health service. In each patient, 1 mandibular incisor was randomly selected for analysis. One calibrated dentist performed all periodontal assessments. Periodontal attachment loss and gingival recession were measured at 6 sites of the selected tooth followed by application of the PST on the buccal surface of the tooth by an independent operator. Each patient was asked to indicate a score for pain intensity on a numeric visual analog scale. The Pearson correlation coefficient was used to investigate and quantify the correlation between predictor variables (periodontal attachment loss and gingival recession) and reported pain. Simple and multiple linear regression analyses were performed to determine the impact of periodontal attachment loss and gingival recession on PST pain scores.

Results

Multivariate analysis showed that periodontal attachment loss contributed significantly to the prediction of pain in response to the PST (\( P < .001 \)). Increases of 1 mm in periodontal attachment loss resulted in a decrease of approximately 0.5 score on the pain scale. Gingival recession also contributed as a predictor of the outcome (\( P < .001 \)) with a decrease of approximately 0.7 in pain scores for every 1-mm increase in gingival recession. The correlations were in the opposite direction than expected.

Conclusions

Periodontal attachment loss and gingival recession strongly influenced reported pain in response to PST with cold stimuli. The effect of both variables was constant (ie, responses to PST decreased gradually with increases in periodontal attachment loss and gingival recession).

Key Words:

Dental pulp test, gingival recession, periodontal attachment loss

Conclusions:

Periodontal attachment loss and gingival recession strongly influenced reported pain in response to PST with cold stimuli. The effect of both variables was constant (ie, responses to PST decreased gradually with increases in periodontal attachment loss and gingival recession).
Abstract

Introduction

The goal of this project was to evaluate the performance of dental pulp sensibility testing with Endo Ice (1,1,1,2-tetrafluoroethane) and an electric pulp tester (EPT) and to determine the effect of several variables on the reliability of these tests.

Methods

Data were collected from 656 patients seen in the University of Iowa College of Dentistry Endodontic graduate clinic. The results of pulpal sensibility tests, along with the tooth number, age, sex, number of restored surfaces, presence or absence of clinical or radiographic caries, and reported recent use of analgesic medications, were recorded. The presence of vital tissue within the pulp chamber was used to verify the diagnosis.

Results

The Endo Ice results showed accuracy, 0.904; sensitivity, 0.916; specificity, 0.896; positive predictive value, 0.862; and negative predictive value, 0.937. The EPT results showed accuracy, 0.75; sensitivity, 0.84; specificity, 0.74; positive predictive value, 0.58; and negative predictive value, 0.90. Patients aged 21–50 years exhibited a more accurate response to cold testing \( (P = .0043) \). Vital teeth with caries responded more accurately to cold testing \( (P = .0077) \). There was no statistically significant difference noted with any other variable examined.

Conclusion

Pulpal sensibility testing with Endo Ice and EPT are accurate and reliable methods of determining pulpal vitality. Patients aged 21–50 exhibited a more accurate response to cold. Sex, tooth type, number of restored surfaces, presence of caries, and recent analgesic use did not significantly alter the results of pulpal sensibility testing in this study.
Conclusions:
The Elements unit with a heat-testing tip provides the most consistent warming of the dental pulp.

Guidelines for Using the AAE Endodontic Case Difficulty Assessment Form

The AAE designed the Endodontic Case Difficulty Assessment Form for use in endodontic curricula. The Assessment Form makes case selection more efficient, more consistent and easier to document. Dentists may also choose to use the Assessment Form to help with referral decision making and record keeping.

Conditions listed in this form should be considered potential risk factors that may complicate treatment and adversely affect the outcome. Levels of difficulty are sets of conditions that may not be controllable by the dentist. Risk factors can influence the ability to provide care at a consistently predictable level and impact the appropriate provision of care and quality assurance.

The Assessment Form enables a practitioner to assign a level of difficulty to a particular case.

**LEVELS OF DIFFICULTY**

**MINIMAL DIFFICULTY**
Preoperative condition indicates outcome complexity (uncomplicated). These types of cases would exhibit only those factors listed in the MINIMAL DIFFICULTY category. Achieving a predictable treatment outcome should be attainable by a competent practitioner with limited experience.

**MODERATE DIFFICULTY**
Preoperative condition is complicated, exhibiting one or more patient or treatment factors listed in the MODERATE DIFFICULTY category. Achieving a predictable treatment outcome will be challenging for a competent, experienced practitioner.

**HIGH DIFFICULTY**
Preoperative condition is exceptionally complicated, exhibiting several factors listed in the MODERATE DIFFICULTY category or at least one in the HIGH DIFFICULTY category. Achieving a predictable treatment outcome will be challenging for even the most experienced practitioner with an extensive history of favorable outcomes.

Review your assessment of each case to determine the level of difficulty. If the level of difficulty exceeds your experience and comfort, you might consider referral to an endodontist.
Anesthesia, Access, & Isolation

- Mandibular: Lidocaine + Anutra
- Maxillary: Articaine
- Dot the Tooth
- Burs: 2 Round, 4 Round, 6 Round, Round Diamond, Cross Cut Bur, Gold Shank Polishing Bur; LA Axxess Burs
- Rubber Dam Clamps: 2AT, 9T, 1T, 14T
- Rubber Dam: Anterior / Posterior / Non Latex

Anesthesia

- Mandibular: Lidocaine + Anutra

Understanding Buffering

- Local Anesthetics is an acidic solution with a pH of ~ 3.9
- To achieve pulpal analgesia the body needs to raise the pH of the local anesthetic toward physiological pH (~ 7.4). This can take up to 15 minutes per patient.
- Sodium Bicarbonate is a neutralizing additive solution
- Buffering (adding sodium bicarbonate to anesthetics) brings pH level closer to physiologic pH prior to injection meaning that the burning sensation of the injection is greatly reduced and the patient gets numb almost immediately.

Buffering: Saves Time

- Buffered Anesthetics more profound anesthesia—6,000 times more active anesthetic (active molecules). Logarithmic scale moving from 3.9 to 7.4 pH
- A by-product of buffered anesthetics is a CO2 enriched microbubble that readily crosses the nerve membrane and in itself contains anesthetic properties not found in unbuffered anesthetics. It essentially produces an immediate effect, similar to that of a topical.
Conclusions: The initial infiltration was not effective in anesthetizing the first molar, canine, or incisor teeth and was only moderately successful in the premolars. Although the repeat infiltration significantly increased the success rate and duration in the premolars, the initial infiltration success rates were not high enough to support the use of this regimen as a combined anesthetic technique.
Conclusions:
For mandibular teeth diagnosed with symptomatic irreversible pulpitis, administration of 30%–50% nitrous oxide resulted in a statistically significant increase in the success of the IAN block compared with room air/oxygen.

Results:
Success of the 1.8-mL volume was 28%, and for the 3.6-mL volume it was 39%. There was no statistically significant difference between the 2 volumes.

Conclusions:
In conclusion, for patients presenting with irreversible pulpitis, success was not significantly different between a 3.6-mL volume and a 1.8-mL volume of 2% lidocaine with 1:100,000 epinephrine. The success rates (28%–39%) with either volume were not high enough to ensure complete pulpal anesthesia.

Dot the Tooth

Burs
Burs: 2 Round, 4 Round, 6 Round, Round Diamond, Cross Cut Bur, Gold Shank Polishing Bur

Cross Cut Bur

Gold Shank Polishing

Easy Endo Access

LA AXXESS

LA Axxess Burs

LA Axxess Diamond Bur (pkg of 6) 815-1415

DIAMOND BUR™

LA AXXESS

Cross Cut Carbide Bur (pkg of 5) 815-1417

#4 Round Carbide Bur (pkg of 5) 815-1414

#2 Round Diamond (pkg of 5) 815-1418

LA Axxess Bur Clip (Empty) 815-1422

Long Tapered Diamond (pkg of 5) 815-1420

Football Diamond (pkg of 5) 815-1419

#1 Line Angle Stainless Steel Axxess Instrument (pkg of 6) 815-1401

#2 Line Angle Stainless Steel Axxess Instrument (pkg of 6) 815-1403

#3 Line Angle Stainless Steel Axxess Instrument (pkg of 6) 815-1405

#4 Line Angle Stainless Steel Axxess Instrument (pkg of 6) 815-1407

LA Axxess Kit (pkg of 5 bur/clip) 815-1434

Secrets of Endodontics, For Your Sixteen Success, Canada, USA
Rubber Dam Clamps

Rubber Dam

Anterior

Posterior

Instrumentation

- K-Flex: #08, #10, #15, #20
- M4 Reciprocating Handpiece
- Orifice Opener: TF .12/25, Pezzo #2, GG#2
- Apex Locators
- Twisted File Green—Yellow—Red
  with new Adaptive Handpiece and Motor

K-Flex Files
Not All Electronic Foramen Locators Are Accurate in Teeth with Enlarged Apical Foramina: An In Vitro Comparison of 5 Brands

Abstract

Introduction

Electronic working length measurement during root canal treatment in teeth with enlarged apical foramina is a challenge. The aims of this in vitro study were (1) to assess the influence of foramen widening on the accuracy of 5 different electronic foramen locators (EFLs) and (2) to compare the accuracy of EFLs in different foramen sizes.

Methods

The following EFLs were used: MiniApex, Root ZX II, iPex, Propex II, and Elements Apex Locator. Each EFL was used in 3 groups (n = 20) of extracted teeth, with foramen diameters of 0.27 mm (G27), 0.47 mm (G47), and 0.72 mm (G72). Working length was measured according to manufacturer's instructions and compared with visual measurements (control method). Results were classified as accurate (differences ≤ 0.05 mm) or inaccurate (differences > 0.5 mm).

Results

In G27, all EFLs yielded accurate findings (intragroup reliability; Fisher exact test, P < .05), compared with only MiniApex, Root ZX II, and Elements Apex Locator in G47 and G72. MiniApex, Root ZX II, and Elements Apex Locator were similarly accurate regardless of foramen size. iPex and Propex II were the least accurate among the devices tested, and foramen diameter influenced their accuracy, with greater diameters yielding poorer EFL performance.

Conclusions

Foramen diameter did not influence the accuracy of MiniApex, Root ZX II, and Elements Apex Locator EFLs. iPex and Propex II showed decreased accuracy as foramen size increased.
Current Challenges and Concepts of the Thermomechanical Treatment of Nickel-Titanium Instruments

**Results:**
This review summarizes the metallurgical properties of next-generation NiTi instruments, the impact of thermomechanical treatment on instrument flexibility, and the resistance to cyclic fatigue and torsion.

**Conclusions:**
The aim of this review was to provide clinicians with the knowledge necessary for evidence-based practices, maximizing the benefits from the selection and application of NiTi rotary instruments for root canal treatment.

**Cyclic Fatigue Study Results**
In a comparison of cyclic bending fatigue, TF performed two to three times better than traditional NiTi files.

**Flexibility Study Results**
TF is up to 70% more flexible than traditional NiTi files.

**Twisted File manufacturing process: Higher cyclical fatigue**
The new manufacturing process produced nickel-titanium rotary files (TF) significantly more resistant to fatigue than instruments produced with the traditional NiTi grinding process.

**Results:**
The PT system removed a significantly higher amount of dentin than the other systems ($P = .025$). At the 1.3-mm level, there was no significant difference in canal transportation and centering ratio among the groups. However, at the other levels, TF maintained the original canal curvature recording significantly the least degree of canal transportation as well as the highest mean centering ratio.

**Conclusions:**
The TF system showed superior shaping ability in curved canals. Revo-S and GTX were better than ProTaper regarding both canal transportation and centering ability.
TF Adaptive: What is it?
- TF Files used with a new motion
- TF Adaptive is an improvement to Wave One® and Reciproc®
- 1 or 2 files possibly 3
- Complete system with gutta percha, obturators and paper points.

What are the Improvements?
- TF Adaptive Movement adjusts based on file load
- Twisted not Ground
- R-Phase Heat Treatment Technology
- Advanced Surface Treatment

Rotary when you want it...
Reciprocation when you need it
- Adaptive Motion changes the motion of the file based on the applied load.
- When file is outside the canal or lightly loaded, the motion is rotary.
- When the file is in the canal (loaded) the motion changes from rotary to reciprocation

Innovation-TF Adaptive Movement
- TFA: Reciprocating angles vary:
  - No load: 600° forward, 0° reverse
  - Loaded: 370° forward and up to 50° reverse
- Wave One® & Reciproc®:
  - 150° forward / 30° backwards

Innovation-Color Code
- Traffic Light: Intuitive, universally accepted color code
Canal size and file sequence determination:
If you struggle to get a #15 K-File to WL then the canal size is Small.
If a #15 K-File is loose then the canal size is Medium / Large.

**Obturation Gutta Percha**
- Shape
- Clean
- Dry
- Fill

**Carrier Based Obturation**
- Shape
- Clean
- Dry
- Fill

<table>
<thead>
<tr>
<th>Feature</th>
<th>Tulsa e-3®</th>
<th>Reciproc®</th>
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<tr>
<td>Motion</td>
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<td>Fixed 150°/ 30° reciprocation</td>
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<td>Presets</td>
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<td>Heat Treat</td>
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<td>Cross Section</td>
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<td>File Sizes</td>
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<td>Single Use</td>
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<td>Pre Sterilized</td>
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TF Adaptive Cross Section

One-piece Design of TF Adaptive Sizes

Wave One® Cross Section

Reciproc® Cross Section “S Shape”

Figure 3. This image depicts 2 different cross-sections on a single WaveOne file. The more distal cross-section improves safety and reduced movement.

File Sizes

File Facts

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<th>TF Adaptive</th>
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Influence of Different Angles of Reciprocation on the Cyclic Fatigue of Nickel-Titanium Endodontic Instruments

Results:
All reciprocating groups (groups 1–4) showed a significant increase in time to failure when compared with group 5 (continuous rotation) (P < .05). Mean time was significantly higher in group 1, followed by group 2. No significant difference was found between groups 3 and 4 (P = .251). Increasing the clockwise angle of reciprocation and consequently increasing the angle of progression for each reciprocation cycle reduced the resistance to cyclic fatigue.

Conclusions:
Movement kinematics (reciprocating movements in various angles) had a significant influence on the cyclic fatigue life of the tested nickel-titanium instruments.

TF Adaptive Technique
Canal size and file sequence determination:
If you struggle to get a #15 K-File to WL then the canal size is Small.
If a #15 K-File is loose then the canal size is Medium / Large.

Evidence Based Endodotics

Advantages of reciprocation...
- Increased cyclical fatigue → Single file?
- Better file control (“Pull down” feel)

Wave One® Technique
Reciproc® Technique

TF in W1/VDW reciprocating motor: Increase in cyclical fatigue
Results: Reciprocating movement resulted in a significantly longer cyclic fatigue life (P < 0.0001) when compared with continuous rotation. No difference was found between reciprocation 150 degrees clockwise/30 degrees counterclockwise (CW/CCW) and 30 degrees CW/150 degrees CCW.
Evidence Based Endodontics

Disadvantage of reciprocation...

Apical debris extrusion

Reciprocation motion: Higher incidence of post operative pain due to apical debris

Results:
The results are shown in Table 1. A statistically significant difference was found between the two techniques. When comparing patients who had developed no pain, the TF instrumentation technique showed significantly better results (chi-squared = 4.059, P = 0.039). When evaluating patients experiencing severe pain, the incidence of symptoms was significantly higher with the Reciproc technique (chi-square = 7.246, P = 0.023). Overall, severe pain occurred in 13.3% patients. More precisely, it occurred in 20% of patients treated with Reciproc.

Evidence Based Endodontics

Single file vs. multiple files...

- Straightens canals → Over instrumentation
- Transports canals → Improper shaping

Results:
ProTaper removed significantly more dentin from the mesiodistal and buccolingual directions of the root canal than the TF (P < .05). No significant difference was recorded for the changes in root canal volume between the two systems (P > .05).

Conclusions:
The TF system was found to cut dentin efficiently with more uniform cutting than ProTaper system.
Conclusions:
The enlargement of the canal to 3 sizes larger than the FABF is adequate, and further enlargement does not provide any additional benefit during endodontic treatment.

Adaptive Care With Class

Class is respect for others. It is a deep and genuine respect for every human being, regardless of status in life.

Class is having manners. It is always saying “thank you” and “please”. It is complimenting people for any and every task done well.

Adaptive Care With Class

Class is treating every person as you would want them to treat you in a similar situation.

Class is never making excuses for your own shortcomings, but always helping another person bounce back from a mistake.