

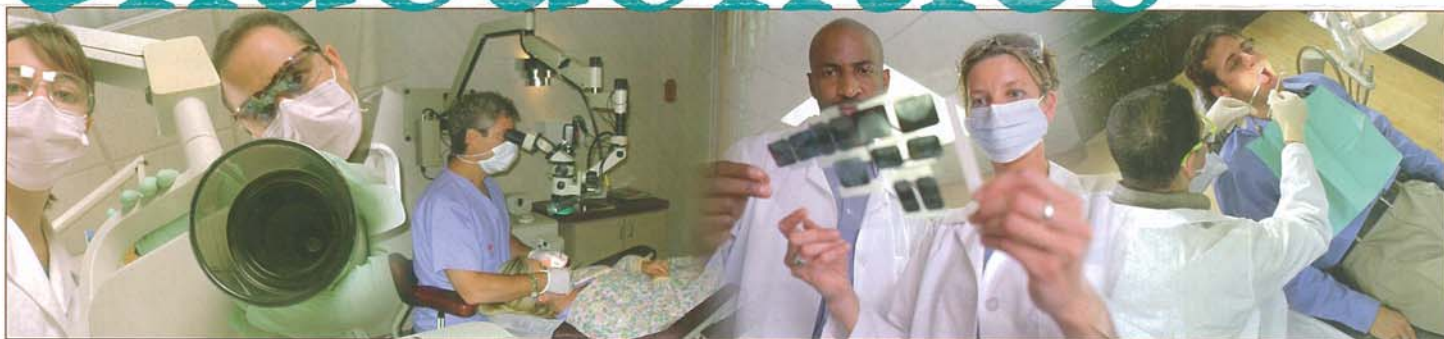
A Professional Courtesy of:

A. K. Bobby Mallik, D.M.D.

3719-B University Commons
Durham, North Carolina 27707
919-493-5332
www.durhamendo.com

Practice Limited to Endodontics

update on endodontics™



NiTi Rotary PathFile vs Manual Preflaring: Effects on Canal Curvature and Canal Aberrations

Nickel-titanium (NiTi) rotary instruments were introduced to improve the quality of root-canal preparation compared with stainless steel hand files. In clinical practice, however, these instruments carry a risk of fracture, albeit small, mainly as a result of flexural (fatigue failure) and torsional (shear failure) stresses. Canal curvature is suspected to be the predominant risk factor for instrument fracture caused by fatigue failure.

Torsional stresses that exceed the elastic limit of the alloy produce plastic deformation of the file, resulting in fracture. Both the clinician and the instrumentation technique used might play significant roles in preventing torsional stresses.

Torsional stresses occur when excessive pressure is placed on the handpiece, when the area of contact between the canal walls and the cutting edge of the instrument is wide, or when the canal diameter is smaller than the dimension of the nonactive or noncutting tip of the instrument. The latter can cause what has been described as taper lock.

This risk might be reduced by performing coronal enlargement and manual preflaring to create a glide path. Thus, the root-canal diameter should be bigger than or at least the same size as the tip of the first rotary instrument used.

New PathFile NiTi rotary instruments (Dentsply Maillefer; Ballaigues, Switzerland) for mechanical preflaring are available with 3 tip sizes, all with .02 taper:

- The PathFile #1 has an International Standards Organization (ISO) #13 tip size;
- The PathFile #2 has an ISO #16 tip size; and
- The PathFile #3 has an ISO #19 tip size.

Inside this issue:

Autumn 2009

- Comparison of Three Materials for Periapical Healing
- Supplemental Articaine for Irreversible Pulpitis
- Diagnostic Factors and Impact on Postoperative Pain



The manufacturer suggests using the first rotary PathFile immediately after a #10 hand K-file has been taken to full working length.

Berutti et al from the University of Turin, Italy, evaluated the maintenance of canal anatomy and the incidence of canal aberrations (apical zip and elbows) when comparing manual (K-files) and rotary preflaring (PathFile). The authors also evaluated the impact of the clinician's expertise on the above outcomes.

A total of 100 S-shaped endodontic training blocks were colored with ink, and preinstrumentation images were acquired digitally. An endodontist performed preflaring with NiTi PathFiles (group 1) and hand stainless steel K-files #08-10-15-20 (group 2); a non-specialist clinician performed preflaring with NiTi PathFiles (group 3) and hand stainless steel K-files (group 4).

Preinstrumentation and postinstrumentation images were superimposed to evaluate the outcomes. Differences in canal curvature modification and incidence of canal aberration were analyzed with the Kruskal-Wallis plus Mann-Whitney post hoc tests and by the Monte Carlo method, respectively.

The NiTi rotary PathFile groups demonstrated significantly less alteration of canal curvature ($p < .001$) and fewer canal aberrations ($p < .001$). No expertise-related difference was found among instrument groups.

Conclusion

The authors found that NiTi rotary PathFiles appear to be suitable instruments for safe and easy creation of the glide path before use of NiTi rotary shaping of the entire canal. NiTi PathFiles demonstrated better

maintenance of the original canal anatomy with less alteration of canal curvature and fewer canal aberrations compared with manual preflaring performed with stainless steel K-files.

Berutti E, Cantatore G, Castellucci A, et al. Use of nickel-titanium rotary PathFile to create the glide path: comparison with manual preflaring in simulated root canals. J Endod 2009;35:408-412.

Comparison of Three Materials for Periapical Healing

Periradicular surgery is an important part of a modern endodontics practice's treatment of failing teeth. Contemporary surgical protocols used with current retrofilling materials have shown excellent success rates in clinical studies. The desired characteristics of retrofilling materials include sealing ability, handling properties, working time, radiopacity, antibacterial properties, biocompatibility and the induction of hard tissue.

After endodontic microsurgery in an animal model, Tawil et al from the University of North Carolina at

Chapel Hill assessed the healing of periapical tissues using 3 materials:

- intermediate restorative material (IRM),
- Geristore and
- mineral trioxide aggregate (MTA).

Forty-eight bicuspids of beagle dogs were accessed, instrumented and infected by placing plaque within the root canals.

Thirty days after periapical radiolucencies were radiographically confirmed, surgical procedures were performed. The root canals were still infected, and no disinfection procedure had been carried out. The root ends were resected, retrograde preparations were made and the experimental materials were placed using a surgical operating microscope. Six months after the surgeries, the animals were sacrificed, and digital radiographic images of the periradicular areas were taken.

Radiographic results showed all experimental groups had more favorable healing compared with the control group ($p < .009$). IRM showed a better healing response than Geristore ($p < .038$). There was no statistically significant difference between IRM

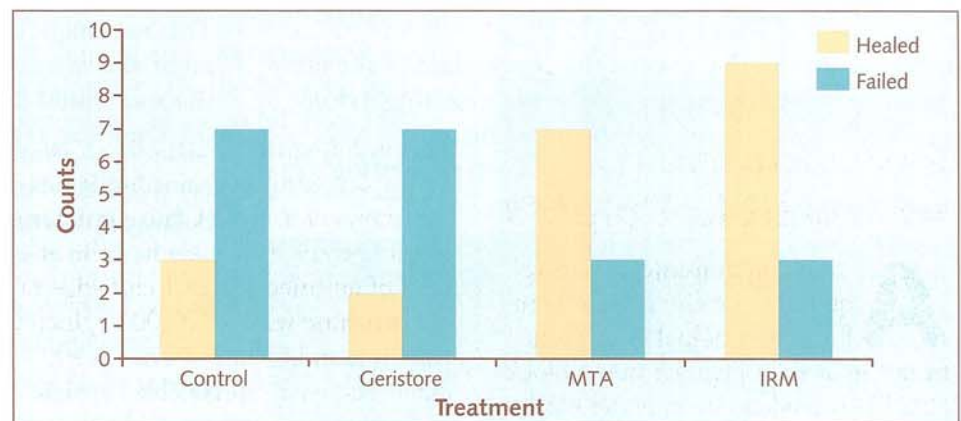


Figure 1. Histologic scores of treated vs untreated teeth.

and MTA ($p = .244$) and between MTA and Geristore ($p = .334$).

Histologic results showed the IRM and MTA groups had more favorable responses than the control and the Geristore groups (Figure 1). Cochran-Mantel-Haenszel tests of association were used for the treatment and the histologic responses, controlling for the tooth location and stratifying by dog. Both IRM ($p < .038$) and MTA ($p < .008$) showed more favorable healing responses than Geristore. There was no statistical difference between IRM and MTA ($p = .765$).

Conclusion

IRM achieved the most favorable healing response; however, these results were not statistically different from that with MTA. Geristore showed the least favorable healing results in the histologic evaluation, even though it showed no radiographic difference when compared with the other experimental groups. Positive histologic and radiographic outcomes demonstrated that IRM and MTA were both suitable retrofilling materials for periradicular surgery.

Tawil PZ, Trope M, Curran AE, et al. *Periapical microsurgery: an in vivo evaluation of endodontic root-end filling materials.* J Endod 2009;35:357-362.

Supplemental Articaïne for Irreversible Pulpitis

A supplemental injection is required to ensure patient comfort when pulpal anesthesia from the inferior alveolar nerve block (IANB) is inadequate in patients with irreversible pulpitis. Studies have

Table 1. Patients who experienced anesthetic success with the supplemental buccal infiltration of articaïne

Tooth	Anesthetic success rate (95% confidence interval)	Number of patients
First molar	58% (37–77)	15/26
Second molar	48% (27–69)	11/23
Second premolar	100% (29–100)	3/3
First premolar	100% (29–100)	3/3

shown success rates of only 19–56% for IANBs in such patients. Several studies have demonstrated that 4% articaïne with 1:100,000 epinephrine is superior to 2% lidocaine with 1:100,000 epinephrine in mandibular buccal infiltration of the first molar in asymptomatic patients.

A previous study comparing articaïne with lidocaine for supplemental buccal infiltration showed that, for the 26 mandibular teeth receiving buccal infiltrations after the IANB failed (13 articaïne and 13 lidocaine), there was no significant difference in efficacy between the 2 solutions. Success was evaluated with a visual analogue scale (VAS) rather than by performing endodontic treatment to determine anesthetic efficacy. Because a standard VAS pain scale does not fully predict the clinical efficacy of a supplemental injection, the supplemental buccal infiltration of articaïne in patients with irreversible pulpitis needs further investigation.

To determine the anesthetic efficacy of supplemental buccal infiltration, Matthews et al from Ohio State University prospectively studied the efficacy of an injection of 1 cartridge of 4% articaïne with 1:100,000 epinephrine in mandibular posterior teeth diagnosed with irreversible pulpitis when the conventional IANB failed.

A total of 55 emergency patients, diagnosed with irreversible pulpitis of a mandibular posterior tooth, received an IANB and had moderate-to-severe pain on endodontic access.

An infiltration of 1 cartridge of 4% articaïne with 1:100,000 epinephrine was administered buccal to the tooth requiring endodontic treatment. Success of the infiltration injection was defined as “no pain” or “mild pain” on endodontic access or instrumentation.

The anesthetic success of the buccal infiltration injection of articaïne is presented in Table 1. The overall success rate for the supplemental buccal infiltration of articaïne in mandibular posterior teeth was 58%.

Conclusion

The authors found that when the IANB fails to provide profound pulpal anesthesia, the supplemental buccal infiltration injection proved successful in 58% of cases of mandibular posterior teeth in patients presenting with irreversible pulpitis. This is lower than the success rates of 82–91% recorded with supplemental intraosseous anesthesia with lidocaine or articaïne.

Matthews R, Drum M, Reader A, et al. *Articaïne for supplemental buccal mandibular infiltration anesthesia in patients with irreversible pulpitis when the inferior alveolar nerve block fails.* J Endod 2009;35:343-346.



Diagnostic Factors And Impact on Postoperative Pain

Accumulation of pulpal remnants or dentinal debris in the apical region is a common event that can cause blockage of a root canal. Purportedly, this can be avoided if patency of the apical foramen during the shaping procedure is established and maintained.

For apical patency, the apical portion of the canal must be maintained free of debris by recapitulation with a small file through the apical foramen. Using a patency file regularly during cleaning and shaping procedures is the most predictable method.

The patency file is a small, flexible K-file, which is passively moved through the apical constriction without widening it. The files used to obtain patency are often the same files initially used to negotiate canals. Advantages of this procedure include

- minimizing the risk of loss of length,
- reducing canal transportation and other accidents such as ledges,
- enhancing irrigation in the apical third of the canal,
- allowing maintenance of the anatomy of the apical constriction and
- improving the tactile sense of the clinician during apical shaping.

One of the reasons stated for not using apical patency is the possible extrusion of debris through the apical foramen, a condition classically related to postoperative pain and infection. Some

endodontists believe that the repeated passing of patency files, even small ones, through the apical foramen can cause an acute periapical inflammatory response and moderate-to-severe postoperative pain.

Arias et al from Complutense University of Madrid, Spain, performed a prospective study to assess whether maintaining apical patency might influence the incidence, degree or duration of postoperative pain. Diagnostic factors such as pulpal status, preoperative pain, or the position or group of the teeth to be treated were considered.

One endodontist performed 300 endodontic treatments, each in a single visit. All patients were informed of the aims and design of the study, and written authorizations were obtained before their inclusion.

Pulpal vitality status (vital/nonvital) was assessed through thermal stimulation with ethyl chloride spray. This was verified by looking for bleeding during the endodontic access. The presence or absence of preoperative pain was noted, as were the tooth type and location.

Patients were randomly assigned to 1 of 2 groups: patency (P) and no patency (NP). In group P ($n = 150$), apical patency was maintained throughout shaping and cleaning procedures by using a #10 K-file between each instrument. In group NP ($n = 150$), efforts were made to avoid going past the working length at all times during treatment.

Patients were informed of the possible occurrence of pain for some days after treatment and were given a questionnaire to be completed and returned. On it, they would record the pres-

ence or absence of postendodontic pain, its duration and level of discomfort rated as

- mild pain—any discomfort of any duration that does not require treatment;
- moderate pain—pain that requires and is relieved with analgesics.
- severe pain—any pain that is not relieved with analgesics.

Of the 300 questionnaires sent, 236 were returned properly answered. Of these, 121 belonged to group P and 115 to group NP. Responses showed that postendodontic pain was significantly less when apical patency was maintained in nonvital teeth. If pain appeared, its duration was longer when apical patency was maintained in teeth with previous pain or located in the mandible.

Conclusion

Maintenance of apical patency does not increase the incidence, degree or duration of postoperative pain. Maintaining apical patency using a #10 K-file can compensate for the eventual longer duration of postoperative pain in certain cases.

Arias A, Azabal M, Hidalgo JJ, de la Marcorra JC. Relationship between postendodontic pain, tooth diagnostic factors, and apical patency. *J Endod* 2009;35:189-192.

In the next issue:

- External cervical resorption
- Irrigant agitation techniques
- RealSeal 1 vs Thermafil

*Do you or your staff have any questions or comments about **Update on Endodontics**? Please call or write our office. We would be happy to hear from you.*

©2009