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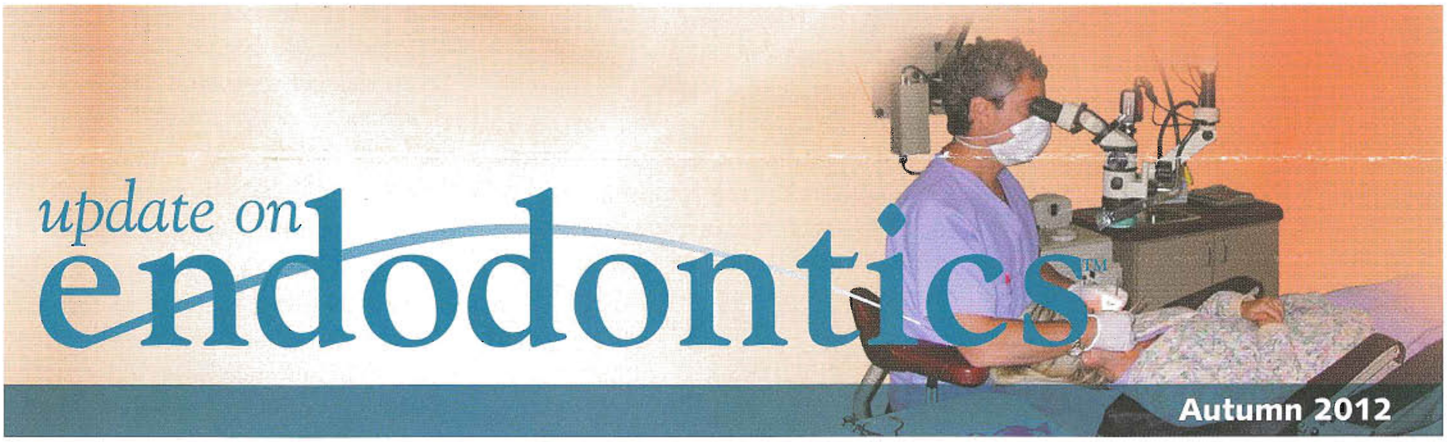
Practice Limited to Endodontics



Type 2 Diabetes Mellitus, Apical Periodontitis and Endodontic Treatment

Diabetes mellitus (DM) is a chronic disease marked by high levels of sugar in the blood (hyperglycemia). The less common type 1 diabetes is usually diagnosed in childhood and is characterized by insufficient production of insulin. It represents approximately 5% to 10% of all diabetes cases. With the more common type 2 diabetes, on the other hand, insulin levels may be normal or reduced; however, there is not a significant insulin deficiency. Type 2 diabetes, which accounts for approximately 85% to 90% of diabetes cases, is instead related to impaired cellular sensitivity to insulin (insulin resistance affecting glucose uptake).

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DM has been regarded as a possible disease modifier in the oral cavity. As such, it has been shown that individuals with diabetes, compared with individuals without diabetes, may exhibit

- an increased prevalence, severity and progression of periodontal disease
- higher risk (2×) of endodontic flare-up
- less favorable apical periodontitis (AP) treatment outcomes
- greater risk for eventual extraction of an endodontically treated tooth
- more teeth with AP

In a cross-sectional study, Marotta et al from Estácio de Sá University, Brazil, evaluated the prevalence of AP and endodontic treatment among patients from an adult Brazilian population with type 2 diabetes, compared with individuals without diabetes. The authors examined full-mouth radiographs from 30 patients with type 2 diabetes and 60 age-and-sex-matched individuals without diabetes. The presence of AP lesions in untreated and root canal-treated teeth was recorded, as well as the number of teeth and the prevalence of root canal treatment.

Results showed that 15% of the teeth from individuals with diabetes displayed AP lesions, whereas the correspondent values in those who did not have diabetes was 12%, a significant difference (Table 1). When the prevalence of AP in either untreated or treated teeth was analyzed separately, it was shown that the significant difference was mostly due to the prevalence of AP in untreated teeth, which was 10% in those with diabetes and 7% in those without ($p = .03$).

Conclusion

AP was significantly more prevalent in untreated teeth of those with type 2 diabetes. This suggests that diabetes may serve as a disease modifier of AP (i.e., individuals with diabetes can be more prone to develop primary endodontic disease). However, findings do not confirm that diabetes may influence the response to root canal treatment because treated teeth had no increased prevalence of AP compared with controls.

Marotta PS, Fontes TV, Armada L, et al. Type 2 diabetes mellitus and the prevalence of apical periodontitis and endodontic treatment in an adult Brazilian population. J Endod 2012;38:297-300.

Table 1. *Prevalence of AP lesions among individuals with and without diabetes*

	Patients with type 2 diabetes, *n* (%)	Controls *n* (%)	*p* value
Total number of teeth	652	1368	
With AP	98 (15)	162 (12)	
No AP	554 (85)	1206 (88)	.05
Number of teeth with RCT	85	206	
With AP	39 (46)	78 (38)	
No AP	46 (54)	128 (62)	.25
Number of teeth with no RCT	567	1162	
With AP	59 (10)	84 (7)	
No AP	508 (90)	1078 (93)	.03

RCT, root canal treatment.

Microbiota of Teeth with Posttreatment Disease

An inflammatory disease, posttreatment apical periodontitis (AP) is caused by a persistent or secondary infection of the endodontically treated root canal system. Culture and molecular studies have found *Enterococcus faecalis* to be the most frequently detected species in root canal-treated teeth, but recent studies have questioned its etiologic role in posttreatment disease. Moreover, taxa related to several other genera, including *Streptococcus*, *Dialister*, *Fusobacterium*, *Filifactor*, *Parvimonas*, *Prevotella*, *Propionibacterium* and *Pyramidobacter*, have also been detected in endodontically treated teeth.

Rôças and Siqueira from Estácio de Sá University, Brazil, surveyed canals for the presence of 28 bacterial taxa using the reverse-capture checkerboard DNA–DNA hybridization method. Additionally, the total bacterial counts and the presence, levels and proportions of *E faecalis* and streptococci were determined by using a real-time quantitative polymerase chain reaction (qPCR) assay.

Participants included 42 patients (30 females, 12 males; age range, 16–70 years; mean age, 41 years) who had been referred for root canal retreatment. All the root canal-treated teeth were asymptomatic, showed radiographic evidence of AP and had had endodontic therapy completed >2 years earlier.

All teeth had been coronally restored, and no direct exposure of the root canal filling material to the oral cavity was evident. Selected teeth showed an absence of periodontal pockets >4 mm.

All clinical samples were positive for the presence of bacteria using the checkerboard and qPCR assays, confirming the primary infectious etiology of posttreatment AP. Results from the checkerboard assay revealed that 24 of the 28 taxon-specific probes tested were reactive with ≥1 samples. The number of selected bacterial taxa detected per sample ranged from 1 to 12. Only 5 cases harbored >5 target taxa. Taxa detected more frequently included

- *Propionibacterium acnes* (52%)
- *Fusobacterium nucleatum* ss *nucleatum* (24%)
- *Streptococcus* species (17%)
- *Propionibacterium acidifaciens* (14%)
- *Pseudoramibacter alactolyticus* (14%)
- *E faecalis* (12%)
- *Tannerella forsythia* (12%)

In the cases testing positive for *E faecalis*, this microorganism was never the dominant taxon. *E faecalis* was detected by qPCR in 38% of the cases, whereas streptococci were found in 41%.

Conclusion

The present findings question the status of *E faecalis* as the main pathogen in posttreatment AP while reinforcing the role of streptococci in persistent/secondary infections. Additionally, the results may allow for the inclusion of some new species in the set of candidate pathogens associated with posttreatment disease.

Rôças IN, Siqueira JF Jr. Characterization of microbiota of root canal-treated teeth with posttreatment disease. J Clin Microbiol 2012;50:1721-1724.

Apical Microsurgery Prognosis After 5 Years

Apical surgery is an important treatment option for teeth with posttreatment apical periodontitis. Specific risk-benefit considerations and patient preferences contribute to the decision-making process when choosing between conventional endodontic retreatment and apicoectomy. As an alternative to nonsurgical or surgical retreatment, the tooth can be extracted and replaced with an implant-supported restoration, with a tooth-supported fixed prosthesis or with a removable prosthesis. Long-term outcome for each treatment option, as suggested by the current best evidence, is a critical consideration in this challenging decision-making process.

Table 2. *Final logistic regression model identifying 2 significant predictors of the healed outcome 5 years after apical microsurgery*

Variable	Odds ratio	Confidence interval	*p* value
Crestal bone level* (0 = >3 mm, 1 = ≤3 mm)	5.10	1.67–16.21	.017
Root-end filling (0 = SuperEBA, 1 = ProRoot MTA)	7.65	2.60–25.27	.003

**Measured on radiographs from the cementoenamel junction or, if not visible, from the margin of a crown or filling.*

The purpose of this prospective longitudinal study by von Arx et al from the University of Bern, Switzerland, was to provide evidence for the 5-year outcome of apical microsurgery in a cohort of patients whose 1-year outcome had been previously reported in the literature. Patient-, tooth- and treatment-related variables were investigated for their outcome-predicting value to enable clinicians to project the particular prognosis for specific patients who consider apical microsurgery vs alternative options.

Participants in this study were recruited from among 251 patients who had undergone apical surgery at the University of Bern from January 2000 to December 2003. A total of 194 teeth among these participants met the inclusion criteria and were enrolled in the study.

Apical microsurgery was performed using 1 of 2 methods of root-end management:

- a root-end cavity prepared with sonic microtips (Kavo Dental, Biberach, Germany) and filled with either SuperEBA (Staident International, Staines, United Kingdom; *n* = 55) or ProRoot MTA (mineral trioxide aggregate; Dentsply, Tulsa Dental Specialties, Tulsa, OK; *n* = 53)
- a shallow concavity was drilled into the root end and sealed with a resin composite (Retroplast; Retroplast Trading, Rorvig, Denmark) bonded with Gluma (Heraeus Kulzer, Dormagen, Germany; *n* = 86)

After the apical microsurgery, patients were prescribed nonsteroidal analgesics and a 0.12% clorhexidine-digluconate mouthwash. In addition, 61% of patients were prescribed prophylactic antibiotics.

Patients were called back for 1-year and 5-year follow-up examinations performed by the same treatment provider. Outcome was assessed based on clinical and radiographic measures. Radiographs were interpreted independently by 2 examiners and the treatment provider.

Teeth were classified as "healed" when presenting with either

- complete healing
- incomplete radiographic healing with absence of any clinical signs and symptoms

Teeth were classified as "not healed" when presenting with

- uncertain or unsatisfactory radiographic healing
- any clinical signs or symptoms regardless of the radiographic appearance

Teeth were classified as "functional" based on the absence of clinical signs and symptoms regardless of the radiographic appearance.

Of the 194 participants, 170 (87.6%) were available for follow-up examination after 5 years. Five years after apical microsurgery, 129 of 170 teeth (75.9%) were classified as healed, compared with 83.8% at 1 year after treatment. Taking into account the absence of clinical signs or symptoms, 145 of 170 teeth (85.3%) were classified as "functional" 5 years after apical surgery.

Conclusion

This study provided a high level of evidence for the 5-year prognosis after apical microsurgery, with 76% of the teeth classified as "healed" and 85% of the teeth classified as "functional." At the conclusion of the study, the authors identified the following outcome predictors:

- The healed rate was higher when the mesial and distal interproximal bone level was ≤3 mm from the cementoenamel junction (or restoration margin).
- The healed rate was higher for root-end fillings with ProRoot MTA (86%) than with SuperEBA (67%; Table 2).

von Arx T, Jensen SS, Hänni S, Friedman S. Five-year longitudinal assessment of the prognosis of apical microsurgery. J Endod *2012;38:570-579.*

Periodontal Ligament vs Intraosseous X-Tip Injections

Pain management and adequate anesthesia are of great importance during dental treatment. It has frequently been shown that the risk of anesthetic failure is highest in mandibular molars, especially if they have irreversible pulpal inflammation. Previous studies have in fact shown that in patients with irreversible pulpitis, the success rate of the inferior alveolar nerve (IAN) block ranges from 19% to 56%. Supplemental injections, typically periodontal ligament (PDL) and intraosseous injections, are essential when pulpal anesthesia from the IAN block is inadequate.

In a single-blind, randomized clinical trial, Zarei et al from Mashhad University of Medical Sciences, Iran, compared the anesthetic efficacy of and heart rate changes associated with PDL injection or intraosseous injection with X-Tip. The study included 40 patients (22 women, 18 men) with irreversible pulpitis who had experienced unsuccessful pain management by IAN block with 2% lidocaine and 1:100,000 epinephrine. Patients were divided equally and randomly into 2 groups:

- The X-Tip group received supplementary anesthesia through intraosseous injection with the X-Tip system
- The PDL group received supplementary anesthesia through PDL injection

A visual analog scale assessed pain severity after each step of injection. Patient heart rate was recorded with a pulse oximeter, and data were coded and analyzed using Mann–Whitney *U*-test.

After the first supplemental injection, anesthetic success was obtained in 100% of X-Tip and 70% of PDL group patients. Compared with the first PDL injection, the first intraosseous injection resulted in a significant increase in heart rate ($p = .001$); however, this increase was short-lived (mean increase, 9–10 beats/minute).

Conclusion

The X-Tip system was more effective than PDL injection as a supplementary anesthetic for pulpectomy in mandibular molars or second premolars. However, intraosseous injections using 1.8 mL of 2% lidocaine with 1:100,000 epinephrine resulted in a transient increase in heart rate.

Zarei M, Ghoddusi J, Sharifi E, et al. Comparison of the anaesthetic efficacy of and heart rate changes after periodontal ligament or intraosseous X-Tip injection in mandibular molars: a randomized controlled clinical trial. Int Endod J *2012;doi:10.1111/j.1365-2591.2012.02050.x.*

In the next issue:

- Accessory roots in maxillary molars
- Root fractures and tooth survival
- Radiolucent jaw lesions

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