

According to the *IEJ* editorial board decision, article abstracts of the members of "Iranian Association of Endodontists" which are accessible in Medline journals will be published in the winter publication of each *IEJ* volume (in alphabetical order)

---

Athanassiadis B, **Abbott PV**, George N, Walsh LJ. **An in vitro study of the antimicrobial activity of some endodontic medicaments and their bases using an agar well diffusion assay.** Aust Dent J. 2009 Jun;54(2):141-6.

**BACKGROUND:** The aim of this study was to determine the in vitro antimicrobial activities of various endodontic medicaments and their bases against selected organisms using an agar diffusion assay. **METHODS:** An agar well diffusion assay was used to test the antimicrobial action of some commonly used endodontic medicaments (Ledermix paste, Pulpdent paste, Ultracal paste, and a 50:50 mix of Ledermix and Pulpdent pastes) and their bases. Three bacterial species (*E. faecalis*, *P. micros*, *P. intermedia*) and one yeast (*C. albicans*) were selected. The diameters of growth inhibition zones and pH were assessed. **RESULTS:** *P. micros* demonstrated the highest level of in vitro resistance. Pulpdent and Ultracal pastes had the highest pH (12.64 and 12.53, respectively). The addition of Pulpdent to Ledermix did not increase the zone sizes significantly. **CONCLUSIONS:** All the commercial products showed some in vitro antimicrobial activity. Ledermix paste and the 50:50 Ledermix/Pulpdent mixture being the most effective in this model. The known anti-inflammatory/analgesic properties of Ledermix and the results from this agar model suggest that the 50:50 Ledermix/Pulpdent combination would be the preferred medicament for clinical use in symptomatic cases, even though the addition of calcium hydroxide to Ledermix did not appear to be synergistic in terms of enhancing the antimicrobial action.

Chailertvanitkul P, **Abbott PV**, Riley TV, Sooksuntisakoonchai N. **Bacterial and dye penetration through interim restorations used during endodontic treatment of molar teeth.** J Endod. 2009 Jul;35(7):1017-22.

**INTRODUCTION:** The purpose of this study was to investigate the association between dye and bacterial penetration through interim restorations used during endodontic treatment. **METHODS:** Sixty-four extracted human teeth were used, with 2 teeth each as positive and negative controls. Endodontic access with a mesio-occluso-distal cavity was prepared. Palatal cusps of maxillary molars and buccal cusps of mandibular molars were removed. Cotton was placed over the canals and covered with Cavit. Thirty teeth were restored with Ketac Silver (KS) and 30 with KS reinforced with a stainless steel band (KSSB). Samples were submerged in India ink mixed with brain heart infusion broth containing *Streptococcus gordonii*. After 3 months of simulated chewing, structural integrity and dye and bacterial penetration were assessed. **RESULTS:** Positive controls had both dye and bacterial penetration. Negative controls had no dye or bacterial penetration. All KS restorations debonded, whereas 18 KSSB restorations (60%) debonded. KS restorations were 1.67 times more likely to debond than KSSB restorations (Fisher exact test). KS was 1.3 times more likely to have dye penetration than KSSB (Fisher exact test)

and 3 times more likely to have bacterial penetration, although not statistically significant (chi(2) test). Overall, 88.3% of specimens had dye penetration, and 20% had bacterial penetration. This 68.3% difference indicated no association between dye and bacterial penetration (exact McNemar test). **CONCLUSIONS:** Stainless steel bands helped maintain structural integrity of KS restorations under masticatory function. Bands helped prevent dye penetration but not bacterial penetration. There was no association between dye and bacterial penetration.

**Abbott PV**, Salgado JC. **Strategies for the endodontic management of concurrent endodontic and periodontal diseases.** Aust Dent J. 2009 Sep;54 Suppl 1:S70-85.

Endodontic and periodontal diseases can provide many diagnostic and management challenges to clinicians, particularly when they occur concurrently. As with all diseases, a thorough history combined with comprehensive clinical and radiographic examinations are all required so an accurate diagnosis can be made. This is essential since the diagnosis will determine the type and sequence of treatment required. This paper reviews the relevant literature and proposes a new classification for concurrent endodontic and periodontal diseases. This classification is a simple one that will help clinicians to formulate management plans for when these diseases occur concurrently. The key aspects are to determine whether both types of diseases are present, rather than just having manifestations of one disease in the alternate tissue. Once it is established that both diseases are present and that they are as a result of infections of each tissue, then the clinician must determine whether the two diseases communicate via the periodontal pocket so that appropriate management can be provided using the guidelines outlined. In general, if the root canal system is infected, endodontic treatment should be commenced prior to any periodontal therapy in order to remove the intracanal infection before any cementum is removed. This avoids several complications and provides a more favourable environment for periodontal repair. The endodontic treatment can be completed before periodontal treatment is provided when there is no communication between the disease processes. However, when there is communication between the two disease processes, then the root canals should be medicated until the periodontal treatment has been completed and the overall prognosis of the tooth has been reassessed as being favourable. The use of non-toxic intracanal therapeutic medicaments is essential to destroy bacteria and to help encourage tissue repair.

Levin LG, Law AS, Holland GR, **Abbott PV**, Roda RS. **Identify and define all diagnostic terms for pulpal health and disease States.** J Endod. 2009 Dec;35(12):1645-57.

**INTRODUCTION:** Consensus Conference Subcommittee 2 was charged with the identification and definition of all diagnostic terms for pulpal health and disease states by using

a systematic review of the literature. **METHODS:** Eight databases were searched, and numerous widely recognized endodontic texts were consulted. For each reference the level of evidence was determined, and the findings were summarized by members of the subcommittee. Highest levels of evidence were always included when available. Areas of inquiry included quantification of pulpal pain, the designation of conditions that can be identified in the dental pulp, diagnostic terms that can best represent pulpal health and disease, and metrics used to arrive at such designations. **RESULTS AND CONCLUSIONS:** On the basis of the findings of this inquiry, specific diagnostic terms for pulpal health and disease are suggested. In addition, numerous areas for further study were identified.

Abbasipour F, Rastqar A, Bakhtiar H, Khalilkhani H, **Aeinehchi M**, Janahmadi M. **The nociceptive and anti-nociceptive effects of white mineral trioxide aggregate.** *Int Endod J.* 2009 Sep;42(9):794-801. Epub 2009 Jun 22.

**AIM:** To assess the nociceptive and antinociceptive effects of white mineral trioxide aggregate (WMTA) using the orofacial formalin test in rats. **METHODOLOGY:** Rats (n = 10 in each group) were separately injected into the ipsilateral upper lip with either 40 microL of a 2.5% formalin solution and eugenol (50 mg kg<sup>-1</sup>) or WMTA (5, 10 and 20 mg dissolved in 0.2 mL saline) alone. In a second experiment to evaluate antinociception effects, 15 min prior to formalin injection, rats were pre-treated with either white ProRoot MTA (20 mg dissolved in 0.2 mL saline) or eugenol. The time each rat spent rubbing the injected site with its paw, as an index of nociception, was recorded for a period of 45 min. **RESULTS:** Administration of 40 microL white ProRoot MTA (5, 10 and 20 mg per 0.2 mL) alone did not produce any significant nociceptive response. Moreover, prior treatment with WMTA caused significant (P < 0.001) inhibition of formalin-induced nociception. Injection of eugenol (50 mg kg<sup>-1</sup>) provoked the first phase of a nociceptive response, although its intensity was reduced compared with that produced by formalin. Pre-treatment with eugenol significantly (P < 0.0001) inhibited the induction of nociception by formalin. Comparison of the behavioural responses observed in WMTA and eugenol-treated rats alone or in combination with formalin revealed that WMTA did not only induce pain behaviour but also prevented formalin-induced nociception. **CONCLUSION:** White mineral trioxide aggregate, when compared with eugenol, was more effective in treating nociceptive pain in the orofacial formalin test.

**Asgary S, Eghbal MJ, Parirokh M, Ghoddusi J. Effect of two storage solutions on surface topography of two root-end fillings.** *Aust Endod J.* 2009 Dec;35(3):147-52.

The effect of different storage solutions on surface topography of mineral trioxide aggregate (MTA) and new experimental cement (NEC) as root-end fillings was investigated. Twenty-four single-rooted teeth were cleaned, shaped and obturated in a same manner. After root-end resection, 3-mm deep root-end cavities were ultrasonically prepared. Samples were randomly divided into four test groups (A1-A2-B1-B2, n = 6). Root-end cavities in groups A and B were filled with MTA and NEC, respectively, and were then stored in 100% humidity for 24 h. The samples of groups 1 and 2 were, respectively, immersed in normal saline (NS) and phosphate buffer saline solutions for 1 week. The samples were imaged under stereomicroscope before and

after immersion and were then investigated and analysed by scanning electron microscopy (SEM) and energy dispersive X-ray analysis (EDXA). Results showed significant difference among studied groups. Surface topography of all samples was altered by crystal formation and precipitation on root-end fillings except for group A1 (MTA-NS). SEM and EDXA results showed that the composition and structure of precipitated crystals were comparable with that of standard hydroxyapatite. It was concluded that biocompatibility, sealing ability, and cementogenic activity of MTA and probably NEC may be attributed to this fundamental bioactive reaction.

**Asgary S, Eghbal MJ, Parirokh M, Ghoddusi J, Kheirieh S, Brink F. Comparison of mineral trioxide aggregate's composition with Portland cements and a new endodontic cement.** *J Endod.* 2009 Feb;35(2):243-50. Epub 2008 Dec 13.

The aim of this study was to compare the compositions of mineral trioxide aggregates (MTAs), Portland cements (PCs), and a new endodontic cement (NEC). Our study also investigated the surface characteristics of MTA and NEC root-end fillings when immersed in normal saline. For part I, we prepared samples of 9 brands of MTAs, PCs, and NEC. The materials were imaged and analyzed by scanning electron microscopy (SEM) and energy dispersive x-ray analysis (EDXA). In part II, 3-mm-deep root-end preparations were filled with MTA or NEC and stored in normal saline for 1 week. Samples were imaged and analyzed by SEM and electron probe microanalysis (EPMA). EDXA investigations revealed differences in the dominant compounds of NEC, PCs, and MTAs. The major components of MTA and PC are the same except for bismuth. The most significant difference was the presence of higher concentrations of Fe (minor element) in gray MTA and PC when compared with white ones. EPMA results revealed remarkably different elements in MTA compared with surrounding dentin, whereas in the NEC group the distribution patterns of calcium, phosphorous, and oxygen were comparable. NEC differs chemically from MTAs and PCs and demonstrates comparable surface composition with adjacent dentin as a root-end filling material.

**Eghbal MJ, Asgary S, Baglue RA, Parirokh M, Ghoddusi J. MTA pulpotomy of human permanent molars with irreversible pulpitis.** *Aust Endod J.* 2009 Apr;35(1):4-8.

The histological success of mineral trioxide aggregate (MTA) pulpotomy for treatment of irreversible pulpitis in human teeth as an alternative treatment was investigated in this study. Fourteen molars which had to be extracted were selected from patients 16-28 years old. The selection criteria include carious pulp exposure with a history of lingering pain. After isolation, caries removal and pulp exposure, MTA was used in pulpotomy treatment. Patients were evaluated for pain after 24 h. Two patients were lost from this study. Twelve teeth were extracted after 2 months and were assessed histologically. Recall examinations confirmed that none of the patients experienced pain after pulpotomy. Histological observation revealed that all samples had dentin bridge formation completely and that the pulps were vital and free of inflammation. Although the results favour the use of MTA as a pulpotomy material, more studies with larger samples and a longer recall period are suggested to justify the use of MTA for treatment of irreversible pulpitis in human permanent teeth.

Samiee M, **Eghbal MJ, Parirokh M**, Abbas FM, **Asgary S**. **Repair of furcal perforation using a new endodontic cement**. Clin Oral Investig. 2009 Nov 4. [Epub ahead of print]

The aim of this study was to compare the histologic response elicited by repairing furcal perforations with mineral trioxide aggregate (MTA) and a new endodontic material in the name of "calcium enriched mixture (CEM) cement" in dogs' teeth. Thirty-four premolars were randomly divided into four groups: MTA (n = 15), CEM (n = 15), positive, and negative controls (n = 4). Root canal therapy were carried out; perforations were made, and the furcation areas were then repaired with MTA or CEM cement. The animals were sacrificed after 3 months. The teeth and their adjacent structures were processed and stained with hematoxylin and eosin stain for histological evaluation. Chi-square test was used to evaluate hard tissue formation, and Mann-Whitney U test was used for the histological evaluation of inflammation. Specimens in positive controls showed severe inflammatory infiltration, prominent granulation tissue, and epithelial proliferation; negative controls demonstrated normal periodontal ligament without inflammatory reactions. Hard tissue formation was observed in all the specimens of the two experimental groups. In inflammatory evaluation, mild inflammation was detected in the experimental groups, and no statistically significant differences were observed between them. MTA and CEM cement showed similar favorable biological response in furcation perforation repair, especially in inducing the formation of cementum-like hard tissue.

Hessari H, Vehkalahti M, **Eghbal MJ**, Murtomaa H. **Lifelong exposure to smoking and oral health among 35- to 44-year-old Iranians**. Oral Health Prev Dent. 2009;7(1):61-8.

**PURPOSE:** The objective of this study was to assess the periodontal treatment needs and the dental status in relation to smoking indicators with special emphasis on lifelong exposure to smoking among 35- to 44-year-old Iranian dentate subjects.

**MATERIALS AND METHODS:** Data (N = 8276) were collected as part of a national survey using the World Health Organization criteria for sampling and for using the data as clinical indicators. Gender, age, place of residence and level of education served as sociodemographic information, and community periodontal index (CPI) and number of teeth served as clinical measurements. The smoking indicators comprised smoking, duration of smoking (years), daily smoking (cigarettes/day) and lifelong exposure to smoking.

**RESULTS:** In total, 81% of the subjects were non-smokers, and 32% of the males and 5% of the females were current smokers. Maximal CPI = 2 was found among 40% of the subjects, and 53% had maximal CPI > or = 3. Higher periodontal treatment needs were associated with smoking (P < 0.01) in males; CPI = 4 was more frequent (P < 0.01) and the mean number of teeth was lower (P < 0.01) among groups with higher levels of smoking. Heavy smokers were the most likely to have maximal CPI > or = 3 (odds ratios, OR = 2.9; 95% confidence intervals, 95% CI = 1.8 to 4.7) and to have < 20 teeth (OR = 2.3; 95% CI = 1.5 to 3.6).

**CONCLUSIONS:** Smoking and lifelong exposure to smoking with a dose-dependent effect seem to be associated with higher periodontal treatment needs and poorer dental status among the middle-aged, particularly in males and in low socioeconomic groups in Iran.

Moradi S, **Ghoddusi J**, Forghani M. **Evaluation of dentinal tubule penetration after the use of dentin bonding agent as a root canal sealer**. J Endod. 2009 Nov;35(11):1563-6. Epub 2009 Sep 20.

**INTRODUCTION:** The purpose of this study was to compare the effectiveness of Excite DSC (Ivoclar Vivadent, Schaan, Liechtenstein), a dentin bonding agent, with AH-26 (Dentsply, Detrey, Germany) as a root canal sealer by evaluating the penetration depth into the dentinal tubules and the tag density of the two compounds.

**METHODS:** Forty-two extracted, single-rooted premolars were prepared and randomly obturated with either Excite DSC (n = 20) or AH-26 (n = 20). Two teeth were filled without sealer and used as controls. Randomly, one half of the specimens in each group (n = 10) was sectioned 3 days after obturation (short-term), and the other half (n = 10) was sectioned after 3 months (long-term). The specimens were sectioned perpendicular to the long axis in two regions and prepared for observation using scanning electron microscopy.

**RESULTS:** In the short-term evaluation, the mean penetration depth of AH-26 in the apical sections (520.48 micromol/L) was significantly higher than that of Excite DSC (0.00 micromol/L). In the long-term evaluation, AH-26 exhibited a significantly greater depth of penetration in both the apical (797.74 micromol/L) and middle sections (1162.11 micromol/L) than Excite DSC (321.43 micromol/L and 657.72 micromol/L, respectively). **CONCLUSION:** AH-26 showed more dentinal tubule penetration depth than Excite DSC in both evaluation periods.

**Hasan Zarrabi M, Javidi M**, Naderinasab M, Gharechahi M. **Comparative evaluation of antimicrobial activity of three cements: new endodontic cement (NEC), mineral trioxide aggregate (MTA) and Portland**. J Oral Sci. 2009 Sep; 51(3):437-42.

Using the agar diffusion method, we conducted an in vitro study to evaluate the antimicrobial activity of mineral trioxide aggregate (MTA), new endodontic cement (NEC) and Portland cement at different concentrations against five different microorganisms. A base layer was made using Muller-Hinton agar for Escherichia coli (ATCC 10538) and Candida (ATCC 10231). For Actinomyces viscosus (ATCC 15987), Enterococcus faecalis (ATCC 10541) and Streptococcus mutans (ATCC 25175) blood agar medium was used. Wells were formed by removing the agar, and the materials were placed in the well immediately after manipulation. The plates were kept at room temperature for 2 h for prediffusion, and then incubated at 37 degrees C for 72 h. The inhibition zones were then measured. The data were analyzed using ANOVA and the Tukey test to compare the differences among the three cements at different concentrations. The positive controls showed bacterial growth, while the negative controls showed no bacterial growth. All materials showed antimicrobial activity against the tested strains except for Enterococcus faecalis. NEC created larger inhibition zones than MTA and Portland cement. This difference was significant for Portland cement (P < 0.05), but not for MTA (P > 0.05). Among the examined microorganisms, the largest inhibition zone was observed for Actinomyces group (P < 0.05). The antimicrobial activity of the materials increased with time and concentration (P < 0.05). It was concluded that NEC is a potent inhibitor of microorganism growth.

Saghravani N, Mohtasham N, **Jafarzadeh H**. **Comparison of immunohistochemical markers between adenoid cystic carcinoma and polymorphous low-grade adenocarcinoma.** J Oral Sci. 2009 Dec;51(4):509-14.

Adenoid cystic carcinoma (AdCC) and polymorphous low-grade adenocarcinoma (PLGA) have several common histological and clinicopathological features that may create diagnostic difficulties. In this study, 10 AdCCs, 8 PLGAs, and 5 normal minor salivary glands as a control group were selected. Sections prepared from each tumor were stained using the streptavidin-biotin system for seven marker antigens: carcinoembryonic antigen (CEA), epithelial membrane antigen (EMA), muscle-specific actin (MSA), vimentin, S100, p53, and Ki-67. Data analysis showed high expression of CEA, MSA and Ki-67 in AdCCs compared with PLGAs, although CEA expression was limited to luminal cells. Ki-67 was expressed in both luminal and non-luminal cells and MSA only in non-luminal cells. Vimentin and S100 showed stronger expression in PLGAs, the expression of vimentin was more noticeable, being focal and widespread. The immunoreactivities of EMA and P53 were not helpful for distinguishing between the two tumors, although the EMA expression pattern in AdCCs was limited to luminal cells, whereas it was present in both luminal and non-luminal cells in PLGAs. Thus, immunohistochemistry can be helpful for differential diagnosis of AdCC and PLGA, particularly that for CEA, vimentin, and Ki-67.

Habibi A, Saghravani N, Zare R, **Jafarzadeh H**. **Clear cell variant of extraosseous calcifying epithelial odontogenic tumor: a case report.** J Oral Sci. 2009 Sep;51(3):485-8.

Calcifying epithelial odontogenic tumor (CEOT) is a benign epithelial odontogenic tumor occurring most frequently in the posterior part of the lower jaw. Extraosseous CEOT is one of the rarest forms of this tumor, and few such cases involving the maxillary gingiva have been reported in the literature. Here we present a case that showed progressive enlargement in the left maxillary gingival area over a period of 11 years. Clinical examination showed an ulcerated mass measuring 52 x 38 mm located adjacent to the lateral incisor and canine. Histologically, the tumor showed proliferation of sheets and cords of epithelial cells with granular, eosinophilic cytoplasm and round to oval nuclei. In other areas, the epithelial cells exhibited a clear, vacuolated cytoplasm and foci of eosinophilic, homogeneous material representing amyloid deposition. The present case of extraosseous CEOT with clear cells was considered to be a very rare form of this tumor.

Gharagozloo S, Faraghat S, **Jafarzadeh H**. **Endodontic treatment of a mesotaurodont maxillary first molar: a case report.** N Z Dent J. 2009 Sep;105(3):87-9.

Taurodontism is an abnormal morphological trait of tooth shape, which usually occurs in multi-rooted teeth. An enlarged pulp chamber and apical displacement of the pulpal floor are characteristics. Endodontic treatment of a taurodont tooth may be very difficult because it requires special care in identifying and treatment of the complex root canal system. The endodontic treatment of a taurodont maxillary first molar is presented.

Kinoshita J, **Jafarzadeh H**, Forghani M. **Vital Bleaching of Tetracycline-Stained Teeth by Using KTP Laser: A Case Report.** Eur J Dent. 2009 Jul;3(3):229-32.

Bleaching of discolored teeth is one of the most important topics in aesthetic dentistry. A great challenge in this area is obtaining good results in tetracycline-stained teeth. The wavelength and features of KTP laser, which is a type of Nd:YAG laser, seem to be appropriate for bleaching of these teeth. This case report underlines the importance of knowledge about the photochemical bleaching by using the KTP laser and its side effects on soft tissues.

Udoye CI, **Jafarzadeh H**. **Dilaceration among Nigerians: prevalence, distribution, and its relationship with trauma.** Dent Traumatol. 2009 Aug;25(4):439-41.

Dilaceration is the result of a developmental anomaly in which an abrupt change in the axial inclination between crown and root is observed. Its prevalence in various races is different and its association with history of trauma is controversial. This study assessed the prevalence and distribution of dilacerated teeth among Nigerians and also investigated whether there was a relation between a history of trauma and teeth that had dilaceration. A total of 465 records of adult attendees (involving 706 teeth and 256 films) were retrospectively studied. Dilacerated teeth were scored using Hamasha et al.'s criteria. Dilaceration occurred more often in the maxilla, posterior teeth and in women, though no association between a history of trauma and occurrence of dilaceration was found. Prevalence of dilaceration in the population and in all teeth was 4.5% and 2.97%, respectively. Dentists should pay detailed attention to baseline radiographs, especially in maxilla and posterior teeth.

**Jafarzadeh H**. **Laser Doppler flowmetry in endodontics: a review.** Int Endod J. 2009 Jun;42(6):476-90.

Vascular supply is the most accurate marker of pulp vitality. Tests for assessing vascular supply that rely on the passage of light through a tooth have been considered as possible methods for detecting pulp vitality. Laser Doppler flowmetry (LDF), which is a noninvasive, objective, painless, semi-quantitative method, has been shown to be reliable for measuring pulpal blood flow. The relevant literature on LDF in the context of endodontics up to March 2008 was reviewed using PubMed and MEDLINE database searches. This search identified papers published between June 1983 and March 2008. Laser light is transmitted to the pulp by means of a fibre optic probe. Scattered light from moving red blood cells will be frequency-shifted whilst that from the static tissue remains unshifted. The reflected light, composed of Doppler-shifted and unshifted light, is returned by afferent fibres and a signal is produced. This technique has been successfully employed for estimating pulpal vitality in adults and children, differential diagnosis of apical radiolucencies (on the basis of pulp vitality), examining the reactions to pharmacological agents or electrical and thermal stimulation, and monitoring of pulpal responses to orthodontic procedures and traumatic injuries. Assessments may be highly susceptible to environmental and technique-related factors. Nonpulpal signals, principally from periodontal blood flow, may contaminate the signal. Because this test produces no noxious stimuli, apprehensive or distressed patients accept it more readily than current methods of pulp vitality assessment. A review of the literature and a discussion of the application of this system in endodontics are presented.

Udoye CI, **Jafarzadeh H**. Cracked tooth syndrome: characteristics and distribution among adults in a Nigerian teaching hospital. *J Endod.* 2009 Mar;35(3):334-6.

This study highlighted the characteristics and distribution of cracked tooth syndrome (CTS) and the associated factors in adult attendees in the University of Nigeria Teaching Hospital. Three hundred seventy patients aged 18 years to 77 years with CTS-like conditions were included and studied over 12 months. The following information was recorded: suspected tooth and the dental arch, restorative status of the tooth, age and sex of the patient, results of bite test and transillumination, and the pulpal and periapical status of the tooth. CTS was seen most often in the 41 to 50 years age band (36.4%), in molars (63.6%), and in the maxillary arch (51.5%). Also, it was more frequent in men (55.8%). About 82% of CTS occurred in amalgam-restored teeth. All cases had a positive response to the bite test and a normal response to the electric pulp test. Only 10% gave a positive history of masticatory accident as against none with history of bruxism habits. It was concluded that patients with unexplained pain in a vital, amalgam-restored tooth (especially in maxillary molars), with or without a history of a masticatory accident, may have a cracked or fractured tooth.

**Jafarzadeh H**, Rosenberg PA. Pulse oximetry: review of a potential aid in endodontic diagnosis. *J Endod.* 2009 Mar;35(3):329-33.

Tests relying on the passage of light through a tooth have been considered to be a suitable means of assessing vascularity and pulp vitality. Pulse oximetry is an effective, objective oxygen saturation monitoring technique broadly used in medicine for recording blood oxygen saturation levels. It can also be used in endodontic diagnosis for differential diagnosis of vital pulps and necrotic ones. In pulse oximetry, light is passed from a photoelectric diode across the tooth structure into a receptor. The instrument detects changes in absorption in both red and infrared light caused by alteration in tissue volume (tissue perfusion) during the cardiac cycle. However, there are some limitations inherent in the technology of pulse oximetry, such as the effect of increased acidity and metabolic rate, which cause deoxygenating of hemoglobin and changes in the blood oxygen saturation. Also, movements of the body or probe can complicate readings. Because this test produces no noxious stimuli, apprehensive or distressed patients may accept it more readily than routine methods. A review of the literature and a discussion of the potential application of this system in endodontics are presented.

**Javidi M**, Moradi S, Rashed R, Raziee L. In vitro comparative study of conventional radiography and Root ZX apex locator in determining root canal working length. *N Y State Dent J.* 2009 Jun-Jul;75(4):48-51.

Success in endodontic treatment depends on various factors. One of the most important is appropriate preparation of the root canal system, in addition to keeping the periapical region intact as much as possible. This is achieved by determining the penetration depth of the instruments into the canal or the "working" length. Several methods are introduced for working-length determination. The most popular techniques are radiography and electronic apex locators. One type of apex locator is the Root ZX. The purpose of this study was to compare the accuracy of the Root ZX in vitro with conventional radiography.

Karami B, **Khayat A**, Moazami F, Pardis S, **Abbott P**. Histological evaluation of the effect of three medicaments; trichloroacetic acid, formocresol and mineral trioxide aggregate on pulpotomised teeth of dogs. *Aust Endod J.* 2009 Apr;35(1):18-28.

The aim of this study was to use clinical, radiographic and histological examinations to compare the dental pulp response in 162 premolar roots of eight dogs when trichloroacetic acid (TCA), formocresol, mineral trioxide aggregate (MTA) and zinc oxide eugenol were used as pulpotomy agents. The teeth were divided into four groups. Following pulpotomy, the teeth were restored with amalgam. The animals were sacrificed at 48 h, 2, 4 and 8 weeks (two dogs at each interval). Histological evaluation indicated no cases with necrosis. After 8 weeks follow up, dentine bridge formation was evident in 20%, 50% and 91.7% of formocresol, TCA and MTA cases respectively. The first signs of bridge formation were seen for MTA at 2 weeks and for TCA at 4 weeks. MTA was superior to formocresol and TCA in treating pulps in dogs. However, bridge formation was seen in 50% of TCA cases after 8 weeks which is a desirable finding in pulpotomy procedures.

Saghiri MA, **Lotfi M**, Saghiri AM, Vosoughhosseini S, **Aeinehchi M**, Ranjkesh B. Scanning electron micrograph and surface hardness of mineral trioxide aggregate in the presence of alkaline pH. *J Endod.* 2009 May;35(5):706-10.

INTRODUCTION: The aim of this study was to evaluate morphologic microstructure and surface hardness of white mineral trioxide aggregate (WMTA) after exposure to a range of alkaline environments during hydration. METHODS: WMTA was mixed and packed into 60 glass tubes. Four groups, each containing 15 tubes, were exposed to pH values of 7.4, 8.4, 9.4, and 10.4, respectively, for 3 days. In 12 tubes in each group, Vickers surface hardness was measured after exposure to alkaline environments. Data were subjected to one-way analysis of variance and a post hoc Tukey test. Three specimens in each group were prepared to be evaluated under a scanning electron microscope using scattered electron (SE) and backscattered electron (BSE) detectors. RESULTS: The mean surface hardness values +/- standard deviation after exposure to pH values of 7.4, 8.4, 9.4, and 10.4 were 58.28 +/- 8.21, 68.84 +/- 7.19, 67.32 +/- 7.22, and 59.22 +/- 9.14, respectively. The difference between these values was statistically significant ( $p = 0.000$ ). There were statistically significant differences between pH values of 8.4 and 9.4 and pH values of 7.4 and 10.4 ( $p > 0.05$ ). The SE detector revealed needle-shaped crystals at pH values of 7.4 and 8.4 and an amorphous microstructure at pH values of 9.4 and 10.4 on WMTA surface. The BSE detector showed more unhydrated structure and pores at pH values of 7.4 and 10.4 compared with pH values of 8.4 and 9.4. CONCLUSIONS: Surface hardness can be influenced by different alkaline pH values. The BSE detector can reveal more microstructure details of WMTA in conjunction with the SE detector. More porosity and unhydrated structure are observed in WMTA exposed to pH values of 7.4 and 10.4.

Saghiri MA, Delvarani A, Mehrvarzfar P, Malganji G, **Lotfi M**, Dadresanfar B, Saghiri AM, Dadvand S. A study of the relation between erosion and microhardness of root canal dentin. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2009 Dec;108(6):e29-34.

OBJECTIVE: The aim of this study was to find a relation between erosion and microhardness of root canal dentin after irrigation with different canal irrigants. STUDY DESIGN: Seventy-two single-canal human premolar teeth were selected

and enlarged by rotary Protaper files. The middle part of each root was transversely sectioned to a 4-mm slice. The initial microhardness values of intact specimens were measured at depths of 100 microm and 500 microm from the pulp-dentin interface using a Vickers microhardness tester. The specimens were divided into 6 groups of 12 specimens and were treated as follows: 1: 2.6% NaOCl, 2: 17% EDTA (5 minutes) then 2.6% NaOCl (5 minutes), 3: 17% EDTA (1 minute) then 2.6% NaOCl (1 minute), 4: MTAD (5 minutes), 5: 2% Chlorhexidine (5 minutes), and 6: saline (control), respectively. Posttreatment microhardness values were obtained in the same manner as the initial ones. Afterwards, the specimens were prepared for scanning electron microscopy analysis. The amount of dentin erosion was examined. RESULTS: Group 2 showed the most erosive effect on dentin ( $P < .0001$ ) along with the least decrease of dentin microhardness at depth of 100 microm, whereas MTAD showed the most reduction of dentin microhardness and less erosive effect on dentin. CONCLUSION: It can be concluded that erosion is not the main factor in decreasing the dentin microhardness, whereas the amount of irrigant penetration might be the main cause.

**Lotfi M, Vosoughhosseini S, Saghiri MA, Mesgariabbasi M, Ranjkesh B. Effect of white mineral trioxide aggregate mixed with disodium hydrogen phosphate on inflammatory cells.** J Endod. 2009 May;35(5):703-5. INTRODUCTION: The aim of this study was subjective evaluation of inflammatory cells subsequent to subcutaneous implantation of white mineral trioxide aggregate (WMTA) mixed with disodium hydrogen phosphate ( $\text{Na}_2\text{HPO}_4$ ) in rats. METHODS: Forty Wistar rats were used in this study. Polyethylene tubes filled with WMTA mixed with  $\text{Na}_2\text{HPO}_4$  and WMTA alone and also empty tubes serving as control were implanted into subcutaneous tissue and harvested after 7, 15, 30, and 90 days. Histologic sections were stained with hematoxylin-eosin and observed under a light microscope. Inflammatory reactions were categorized as 0 or none (without inflammatory cells), 1 or mild (inflammatory cells  $< 25$ ), 2 or moderate (25-125 inflammatory cells), and 3 or severe (more than 125 inflammatory cells). Statistical analyses were performed with the Kruskal-Wallis and Mann-Whitney tests. RESULTS: WMTA alone provoked a moderate inflammatory reaction after 7 and 15 days, which significantly differed from WMTA mixed with  $\text{Na}_2\text{HPO}_4$  and the control group, which provoked a mild inflammatory reaction ( $P < .05$ ). However, there were no significant differences at any period beyond 30 days. CONCLUSIONS: This study indicates that adding  $\text{Na}_2\text{HPO}_4$  to WMTA creates a more biocompatible material than WMTA alone.

**Mohammadi Z, Abbott PV. Antimicrobial substantivity of root canal irrigants and medicaments: a review.** Aust Endod J. 2009 Dec;35(3):131-9.

Disinfection of the root canal system is one of the primary aims of root canal treatment. This can be achieved through the use of various antimicrobial agents in the form of irrigants and medicaments. These agents are only used for relatively short periods of time ranging from minutes (for irrigants) up to days or several weeks (for medicaments) and therefore their long-term antimicrobial effects rely on whether or not the particular agent has any properties of substantivity. If irrigants and medicaments had effective long-term residual antimicrobial activity that could prevent re-infection of the root canal system, then the long-term outcomes of endodontic

treatment might be improved. Only a small number of studies have investigated the short-term substantivity of commonly used antimicrobial agents and the results show substantivity of chlorhexidine lasts for up to 12 weeks and tetracycline for up to 4 weeks. However, it is not known whether the substantivity of these agents will last for longer periods of time as this has not been investigated.

**Mohammadi Z, Abbott PV. The properties and applications of chlorhexidine in endodontics.** Int Endod J. 2009 Apr;42(4):288-302. Epub 2009 Feb 7.

Microorganisms and their by-products are considered to be the major cause of pulp and periradicular pathosis. Hence, a major objective in root canal treatment is to disinfect the entire root canal system, which requires that all contents of the root canal system be eliminated as possible sources of infection. This goal may be accomplished using mechanical instrumentation and chemical irrigation, in conjunction with medication of the root canal system between treatment sessions. To reduce or eliminate bacteria, various irrigation solutions have been advocated. Chlorhexidine is a cationic molecule, which can be used during treatment. It has a wide range of antimicrobial activity. Its cationic structure provides a unique property named substantivity. The purpose of this paper is to review the structure and mechanism of action of CHX, its antibacterial and antifungal activity, its effect on biofilm, its substantivity (residual antibacterial activity), its tissue solvent ability, its interaction with calcium hydroxide and sodium hypochlorite, its anticollagenolytic activity, its effect on coronal and apical leakage of bacteria, its toxicity and allergenicity and the modulating effect of dentine and root canal components on its antimicrobial activity. A Medline search was performed from 1981 to the end of March 2008 and was limited to English-language papers. The keywords searched on Medline were 'chlorhexidine AND endodontics', 'chlorhexidine AND root canal therapy', 'chlorhexidine AND substantivity' and 'chlorhexidine AND toxicity'. The reference lists of each article were manually checked for additional articles of relevance.

**Mohammadi Z, Abbott PV. On the local applications of antibiotics and antibiotic-based agents in endodontics and dental traumatology.** Int Endod J. 2009 Jul;42(7):555-67. Epub 2009 May 8.

Antibiotics are a valuable adjunctive to the armamentarium available to health professionals for the management of bacterial infections. During endodontic treatment and when managing trauma to the teeth, antibiotics may be applied systemically (orally and/or parenterally) or locally (i.e. intradentally via irrigants and medicaments). Due to the potential risk of adverse effects following systemic application, and the ineffectiveness of systemic antibiotics in necrotic pulpless teeth and the periradicular tissues, the local application of antibiotics may be a more effective mode for delivery in endodontics. The aim of this article was to review the history, rationale and applications of antibiotic-containing irrigants and medicaments in endodontics and dental traumatology. The search was performed from 1981 to 2008 and was limited to English-language papers. The keywords searched on Medline were 'Antibiotics AND endodontics', 'Antibiotics AND root canal irrigation', 'Antibiotics AND intra-canal medicament', 'Antibiotics AND Dental trauma' and 'Antibiotics AND root resorption'. The reference section of each article was manually searched to find other suitable sources of information. It seems that local routes of antibiotic administration are a more effective mode than systemic

applications. Various antibiotics have been tested in numerous studies and each has some advantages. Tetracyclines are a group of bacteriostatic antibiotics with antibacterial substantivity for up to 12 weeks. They are typically used in conjunction with corticosteroids and these combinations have anti-inflammatory, anti-bacterial and anti-resorptive properties, all of which help to reduce the periapical inflammatory reaction including clastic-cell mediated resorption. Tetracyclines have also been used as part of irrigating solutions but the substantivity is only for 4 weeks. Clindamycin and a combination of three antibiotics (metronidazole, ciprofloxacin and minocycline) have also been reported to be effective at reducing bacterial numbers in the root canal systems of infected teeth.

**Mohammadi Z. Systemic and local applications of steroids in endodontics: an update review.** *Int Dent J.* 2009 Oct;59(5):297-304.

Up to 80% of endodontic patients who report with preoperative pain continue to experience some level of pain following the endodontic procedure. Various classes of drugs have been studied for the management of post-treatment endodontic pain. Since endodontic pain is often associated with chronic inflammation, the presence of bacterial by-products, influx of primed immune cells and activation of the cytokine network and other inflammatory mediators, pain may be reduced by administration of glucocorticoid steroids. The aim of this paper is to review the pharmacology and mechanisms of actions of steroids as well as their indications for endodontics, contraindications, dosages and side-effects.

**Mohammadi Z. Systemic, prophylactic and local applications of antimicrobials in endodontics: an update review.** *Int Dent J.* 2009 Aug;59(4):175-86.

Antibiotics were first discovered in the late 1920s but were not routinely used clinically until the early 1940s during the Second World War. They can be used as an adjunct to endodontic treatment in a number of ways-systemically, prophylactically and locally. There are few real indications for the systemic use of antibiotics in conjunction with endodontic treatment. They are only needed when the body's efforts at fighting bacteria are failing. Use of antibiotics to prevent infection (antibiotic prophylaxis) may prevent some case of bacterial endocarditis. Therefore, prophylaxis is recommended for individuals in high-risk and moderate-risk categories. Another mode of application of antibiotics is local application as intracanal medicaments and root canal irrigants.

**Mohammadi Z. In vitro evaluation of apical extrusion of bacteria following use of new rotary instrumentation system.** *N Y State Dent J.* 2009 Apr;75(3):28-30.

The aim of this study was to evaluate the number of bacteria extruded apically from extracted teeth ex vivo after canal instrumentation using two engine-driven nickel-titanium instruments (Flex Master and V-Taper). Seventy extracted maxillary central incisor teeth were used. After preparing access cavities, root canals were contaminated with a suspension of *Enterococcus faecalis*, then dried. The contaminated roots were divided into two experimental groups of 30 teeth each and one control group of 10 teeth. Bacteria extruded from the apical foramen during instrumentation were collected into vials. The microbiological samples from the vials were incubated in culture media for 24 hours. Colonies of bacteria were

counted, and the results were given as number of colony-forming units. The data obtained were analyzed using the Kruskal-Wallis one-way analysis of variance and Mann-Whitney U-tests, with  $\alpha = 0.05$  as the level for statistical significance. Results showed that there was no significant difference as to the number of extruded bacteria between the two engine-driven systems ( $P > 0.05$ ). Both engine-driven nickel-titanium systems extruded bacteria through the apical foramen.

**Mohammadi Z. Antibiotics as intracanal medicaments: a review.** *J Calif Dent Assoc.* 2009 Feb;37(2):98-108.

Antibiotics are an extremely valuable addition to the armamentarium available to health practitioners for management of bacterial infections. Due to the potential risk of adverse systemic effects of systemic applications and ineffectiveness of systemic antibiotics in the necrotic pulpless tooth and the periradicular tissues, local application of antibiotics may be a more effective mode for delivering antibiotics to infected root canals. This paper reviews the history, rationale, and applications of antibiotics and antibiotics-containing medicaments in endodontics.

**Mohammadi Z. Local applications of tetracyclines in endodontics and dental trauma: a review.** *Dent Today.* 2009 Jan;28(1):95-6, 98, 100-1; quiz 101.

Local application of antibiotics within the root canal system may be a more effective mode for delivering the drug. Tetracyclines have been used to remove the smear layer from instrumented root canal walls, for irrigation of retrograde cavities during periapical surgical procedures, and as an intracanal medicament. Substantivity of tetracyclines has been shown for up to at least 12 weeks. BioPure MTAD is effective in removing the smear layer. However, the antimicrobial efficacy against *E faecalis* of 1.3% NaOCl/MTAD compared with that of the combined alternate use of 5.25% NaOCl and 15% EDTA is still controversial. Substantivity of MTAD has been shown for up to 4 weeks. Furthermore, application of MTAD to 1.3% NaOCl-irrigated dentin may reduce its substantivity. Tetraclean is a mixture of an antibiotic (doxycycline), an acid, and a detergent (like MTAD), with a very low surface tension and high degree efficacy against bacterial biofilms. Ledermix, a glucocorticosteroid-antibiotic compound, due to anti-inflammatory and antiresorptive properties, reduces the inflammatory reaction including clastic-cell mediated resorption, significantly lowers the incidence of replacement resorption, and thus prompts more favorable healing in replanted teeth. A 50:50 mixture of Ledermix paste and Ca(OH)<sub>2</sub> has been advocated as an intracanal dressing in cases of infected root canals, pulp necrosis and infection with incomplete root formation (apexification), perforations, inflammatory root resorption, inflammatory periapical bone resorption, and for the treatment of large periapical radiolucent lesions.

**Mohammadi Z. Laser applications in endodontics: an update review.** *Int Dent J.* 2009 Feb;59(1):35-46.

The search for new devices and technologies for endodontic procedures always has been challenging. Since the development of the ruby laser by Maiman in 1960 and the application of the laser for endodontics by Weichman in 1971, a variety of potential applications for lasers in endodontics have been proposed. With the development of thinner, more flexible and durable laser fibres, laser

applications in endodontics have increased. Since laser devices are still relatively costly, access to them is limited. The purpose of this paper is to summarise laser applications in endodontics, including their use in pulp diagnosis, dentinal hypersensitivity, pulp capping and pulpotomy, sterilisation of root canals, root canal shaping and obturation and apicectomy. The effects of lasers on root canal walls and periodontal tissues are also reviewed.

**Mohammadi Z. Lasers as aids for cleaning, shaping, and obturation of the root canal system.** Dent Today. 2009 Jul;28(7):81-2, 84, 86; quiz 87, 80.

**Mohammadi Z. Iodine compounds in endodontics: an update review.** Dent Today. 2009 Jun;28(6):58, 60-3; quiz 63.

**Mozayeni MA, Javaheri GH, Poorroosta P, Ashari MA, Javaheri HH. Effect of 17% EDTA and MTAD on intracanal smear layer removal: a scanning electron microscopic study.** Aust Endod J. 2009 Apr;35(1):13-7.

The purpose of this study was to determine the effectiveness of MTAD as the final irrigant to remove the smear layer, compared with that of 17% EDTA, both following root canal irrigation with 5.25% sodium hypochlorite (NaOCl). Fifty-five extracted maxillary and mandibular single-rooted human teeth were prepared by a crown-down technique using rotary 0.04 and 0.06 taper nickel-titanium files. 5.25% sodium hypochlorite was used as the intracanal irrigant. The canals were then treated with 5 mL of one of the following solutions as final rinse: 5.25% sodium hypochlorite, 17% EDTA or MTAD. The presence or absence of smear layer in the coronal, middle and apical portion of each canal was examined with a scanning electron microscope. The results showed that MTAD is an effective final rinse solution for removing the smear layer in canals irrigated with sodium hypochlorite. When 17% EDTA was used as a final rinse, the smear layer was removed from the middle and coronal thirds of canal preparations, but it was less effective in the apical third of the canals.

**Moradi S, Naghavi N, Rohani E, Javidi M. Evaluation of microleakage following application of a dentin bonding agent as root canal sealer in the presence or absence of smear layer.** J Oral Sci. 2009 Jun;51(2):207-13.

The aim of this study was to compare the apical leakage of roots obturated with gutta-percha using either an epoxy resin sealer (AH26) or a dual cure dentin binding agent (Excite DSC) as sealer in the presence or absence of smear layer with fluid filtration method. The canals of eighty-six, single-rooted premolars were instrumented until a #40 K-file fit at working length and then randomly divided into four groups (n = 20) with the remaining six used as controls. Groups 1 and 2 were filled with gutta-percha using AH26 as sealer; groups 3 and 4 were filled with gutta-percha and Excite DSC as sealer. Groups 1 and 3 were smear layer-positive, while group 2 and 4 were designated as smear layer-negative. After 3 days and 3 months, the samples were connected to a fluid filtration system. Analysis of data with the paired t-test showed that microleakage in AH26 groups (with and without smear layer) decreased significantly at 3 months compared to 3 days; however, in the DBA groups, the amount of microleakage at 3 days and 3 months was not significantly different. According to the results of this study, DBA (Excite DSC) had better apical sealing ability and could be applied clinically.

**Hajizadeh H, Ghavamnasiri M, Namazikhah MS, Majidinia S, Bagheri M. Effect of different conditioning protocols on the adhesion of a glass ionomer cement to dentin.** J Contemp Dent Pract. 2009 Jul 1;10(4):9-16.

**AIM:** The purpose of this study was to assess the effect of different surface treatments on the shear bond strength (SBS) of a resin modified glass ionomer cement (RMGIC) to dentin. **METHODS AND MATERIALS:** Forty human third molar teeth were randomly divided into four groups (n=10). The occlusal enamel was removed to obtain a flat surface of dentin. Each group was treated as follows: Group 1: 10% polyacrylic acid (positive control); Group 2: 37% phosphoric acid followed by 5% sodium hypochlorite (NaOCl); Group 3: 1.1% APF gel; and Group 4: no conditioning (negative control). Fuji II LC glass ionomer was bonded to dentin using a cylindrical mold. Samples were thermocycled and debonded using a shear force with a crosshead speed of 0.5 mm/min. Data were analyzed using one-way analysis of variance (ANOVA) and Tukey tests ( $\alpha = 0.05$ ). **RESULTS:** The mean SBS in Groups 1 through 4 were 11.562 $\pm$ 3.148, 8.060 $\pm$ 1.781, 8.830 $\pm$ 1.554, and 3.074 $\pm$ 0.784 (MPa), respectively. There were significant differences in the SBS between Group 1 with other groups ( $P < 0.05$ ). There were no statistically significant differences between Groups 2 and 3, but the SBS of both of them were significantly higher than that of Group 4 ( $P < 0.05$ ). **CONCLUSION:** Although the dentin SBS of Fuji II LC after conditioning with APF and phosphoric acid followed by NaOCl was greater than the unconditioned group (Group 4), polyacrylic acid yielded the best result. **CLINICAL SIGNIFICANCE:** Proper conditioning of dentin is effective in promoting close adaptation of RMGIC to dentin.

**Hajizadeh H, Namazikhah MS, Moghaddas MJ, Ghavamnasiri M, Majidinia S. Effect of posts on the fracture resistance of load-cycled endodontically-treated premolars restored with direct composite resin.**

**AIM:** The aim of this study was to investigate the fracture resistance and failure mode of premolars restored with composite resin using various prefabricated posts. **METHODS AND MATERIALS:** Sixty sound maxillary premolars were divided into four equal sized groups. All but the control group received endodontic treatment followed by placement of mesiodistoclusal (MOD) composite restorations (Tetric Ceram) as follows: Group T = no post, Group DT = fiber reinforced composite (FRC) post (DT Light), Group FL = prefabricated metal post (Filpost). The control group (C) had no cavities prepared. After thermal and load cycling, static load was applied at a 30 degrees angle until fracture. Failure modes were categorized as restorable and non-restorable. Data were analyzed using the analysis of variance (ANOVA) and Duncan tests ( $\alpha = 0.05$ ). **RESULTS:** The mean values of fracture loads (N) for all groups were: C (880 $\pm$ 258); T (691 $\pm$ 239); DT (865 $\pm$ 269); and FL (388 $\pm$ 167). Statistically significant differences ( $P < 0.05$ ) were observed for all groups except between groups C and DT. The Chi Square test showed failure modes in groups C and DT were mostly restorable. The most non-restorable fractures were observed in group FT. **CONCLUSION:** Intact teeth and the teeth restored with composite and quartz fiber posts had a similar fracture resistance and the failure modes were mostly restorable. The lowest fracture resistance and the most non-restorable failures were observed in conjunction with metal posts. **CLINICAL SIGNIFICANCE:** The results of this in vitro study suggest the use of a quartz fiber post used in



conjunction with an MOD composite resin restoration improves fracture resistance in an endodontically treated premolar

Mousavinasab M, Namazikhah MS, Modaresi J, Behzadi A. **Undetected microscopic pulp exposures in deep class II cavities.** J Calif Dent Assoc. 2009 Jan;37(1):26-30.

Exposure of the pulp may act as a great insult during preparations, so this study investigated the probability of clinically undiagnosed pulp microexposures. The axial wall of 30 deep class II preparations in human premolars were searched for any microexposure after extraction. Seven teeth (23.7 percent) showed some kind of exposure. It is concluded that approximately 1/5 of class II preparations with the RDT less than 0.5mm may have a pulp microexposure.

Yazdi KA, Bayat-Movahed S, Aligholi M, Hayes SJ, Nekoofar MH. **Microleakage of human saliva in coronally unsealed obturated root canals in anaerobic conditions.** J Calif Dent Assoc. 2009 Jan;37(1):33-7.

The purpose of this study was to determine the time required for anaerobic bacteria in natural human saliva to contaminate root-filled teeth. Thirty-two single-rooted teeth were cleaned, shaped, filled, and exposed to human saliva for 120 days. Teeth that had not leaked were subjected to polymerise chain reaction examination. Sixty-six percent of the experimental group were totally contaminated. A PCR examination revealed there was no contamination in the apical 3 mm of leakage-free teeth.

Nekoofar MH, Namazikhah MS, Shevkhrezae MS, Mohammadi MM, Kazemi A, Aseeley Z, Dummer PM. **pH of pus collected from periapical abscesses.** Int Endod J. 2009 Jun;42(6):534-8.

AIM: To determine the pH of pus collected from periapical abscesses. METHODOLOGY: Forty patients (Male = 17/Female = 23) between the ages 17 and 37 years, each with a periapical abscess and with no relevant medical history, were recruited. All the participants had moderate-to-severe pain on percussion accompanied by localized or generalized swelling. At least 1 mL of pus was aspirated from each participant using a No 20 gauge needle. A pH meter was used to define the pH of the pus immediately following aspiration. RESULT: The mean pH of pus from the periapical abscesses of patients was 6.68 +/- 0.324 with a range between 6.0 and 7.3. There was no statistically significant difference in pH by gender or age. CONCLUSION: The mean pH of pus from periapical abscesses was generally acidic, but some samples (two female and three male) were neutral and some samples (four female and one male) were alkaline.

Kayahan MB, Nekoofar MH, Kazandağ M, Canpolat C, Malkondu O, Kaptan F, Dummer PM. **Effect of acid-etching procedure on selected physical properties of mineral trioxide aggregate.** Int Endod J. 2009 Nov;42(11):1004-14. Epub 2009 Sep 1.

AIM: To evaluate the effect of acid-etch procedures on the compressive strength and surface microhardness of tooth-coloured mineral trioxide aggregate (MTA). METHODOLOGY: White ProRoot MTA (Dentsply Tulsa Dental) was mixed and packed into cylindrical tubes of 4 mm in diameter and 6 mm in height. Three groups, each of 15 specimens were subjected to an acid-etch procedure either 4, 24 or 96 h after mixing. The compressive strength was measured and compared with unetched control groups.

Differences between groups were analysed using the Kruskal-Wallis test. A further batch of cylindrical specimens of 6 mm in diameter and 12 mm in height were prepared for testing surface microhardness. Three groups of 15 specimens were subjected to the acid-etch procedure at either 4, 24 or 96 h following mixing. Data were subjected to one-way anova. Changes in the surface microstructure before and after the acid-etch procedures were analysed using a scanning electron microscope (SEM). RESULTS: There was a general trend for the compressive strength and surface microhardness of specimens to increase with time. In terms of compressive strength, the increase was significant between 4 h and the other time periods for both experimental and control groups ( $P < 0.0001$ ); however, there was no significant difference between 24 and 96 h. The increase in surface microhardness was significant between 4, 24 and 96 h ( $P < 0.0001$ ). In addition, there was a significant difference between experimental and control groups at all time periods ( $P < 0.0001$ ). SEM examination revealed morphological differences between the intact and the etched MTA surfaces. CONCLUSIONS: Acid-etch procedures affected the compressive strength and surface microhardness of ProRoot MTA. This indicates that it may be better to postpone restorative procedures for at least 96 h after mixing MTA. Etching created surface changes that might have the potential to enhance bonding of resinous materials.

Nekoofar MH, Haddad DC, Nolde J, Aseeley Z. **Water content of ampoule packaged with ProRoot MTA.** Int Endod J. 2009 Jun;42(6):549-51; author reply 552-3.

Parirokh M, Askarifard S, Mansouri S, Haghdoust AA, Raouf M, Torabinejad M. **Effect of phosphate buffer saline on coronal leakage of mineral trioxide aggregate.** J Oral Sci. 2009 Jun;51(2):187-91.

This study was carried out to compare the bacterial leakage of MTA used as a root-end filling material when it was kept in phosphate buffer saline (PBS) or normal saline. In this study, 72 freshly extracted teeth were used. The roots were randomly divided into four experimental groups of 15 each (groups I and II gutta-percha obturation + MTA, groups III and IV only MTA) and two positive and negative control groups of six each. The samples in groups I and III were kept in normal saline for 1 month while the samples in groups II and IV were kept in PBS. Enterococcus faecalis was used for determination of the bacterial penetration. Kaplan-Meier survival curve and chi(2) test were employed for data analysis. The obturated samples with root-end filling showed significantly longer duration of resistance to bacterial penetration than canals without obturation ( $P < 0.05$ ). The roots that were placed in PBS (groups II and IV) showed significantly less bacterial penetration in comparison with the roots that were stored in normal saline ( $P < 0.05$ ). In conclusion, MTA, which acts as a bioactive material, should be placed in a synthetic tissue fluid before any leakage evaluation.

Rahimi S, Shahi S, Yavari HR, Reyhani MF, Ebrahimi ME, Rajabi E. **A stereomicroscopy study of root apices of human maxillary central incisors and mandibular second premolars in an Iranian population.** J Oral Sci. 2009 Sep;51(3):411-5.

Mandibular second premolars and maxillary central incisors usually have one root, one canal, and one apical foramen. However, some studies have revealed anatomic variations in these teeth. The aim of the present study was to investigate

such variations in canal configuration, foramina, lateral and accessory canals and apical deltas in the root apex of human maxillary central incisors and mandibular second premolars, using a clearing technique and stereomicroscopy. One hundred maxillary central incisors and 137 mandibular second premolars were collected, and India ink was injected into their canals. The teeth were then demineralized with 0.5 N nitric acid, cleared with methyl salicylate, and studied at x 5 and x 16 magnification. The incidence of one canal and one apical foramen was 100% for maxillary central incisors and 94.16% for mandibular second premolars. The main apical foramen was located in the center of the root apex in 21.89% and 17% of mandibular second premolars and maxillary central incisors, respectively. Lateral and accessory canals were found in 84.50% and 77.15% of maxillary central incisors and mandibular second premolars, respectively. Several foramina were found in 11% of maxillary central incisors and 24.08% of mandibular second premolars. Apical deltas were seen in 4.38% and 2% of mandibular second premolars and maxillary central incisors, respectively. The rate of anatomic variations in the apical part of the tooth, especially in posterior teeth, is thus considered to be high.

**Rahimi S, Shahi S, Kimyai S, Khayyam L, Abdolrahimi M. Effect of calcium hydroxide dressing on microleakage of composite restorations in endodontically treated teeth subsequent to bleaching.** Med Oral Patol Oral Cir Bucal. 2009 Sep 21. [Epub ahead of print]

Objective: This study evaluates the effect of calcium hydroxide dressing on microleakage of composite restorations following non-vital bleaching. Methods: A total of 45 sound extracted human maxillary central incisors underwent endodontic treatment. The teeth were randomly divided into three groups (n=15). In group 1, access cavities were restored with composite. In group 2, the teeth underwent a bleaching procedure for one week before being restored with composite. In group 3, following a bleaching procedure, calcium hydroxide paste was placed in the pulp chamber for one week. The teeth were then restored with composite. The specimens were subjected to a dye leakage test. The data was analyzed using Kruskal-Wallis and Mann-Whitney U tests. Results: There were significant differences between the groups ( $P < 0.0005$ ). No statistically significant differences were found between groups 2 and 3, while the differences between other groups were significant. Conclusions: The bleaching agent increased microleakage of composite restorations in non-vital bleaching, whereas microleakage was not found to be increased by calcium hydroxide.

Donadio M, Jiang J, He J, Wang YH, **Safavi KE**, Zhu Q. **Cytotoxicity evaluation of Activ GP and Resilon sealers in vitro.** Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009 Jun;107(6):e74-8.

OBJECTIVE: This study is to evaluate the cytotoxicity of Activ GP and RealSeal sealers in a cell culture system in vitro, and to compare them with traditional AH 26 and Kerr sealers. STUDY DESIGN: Samples of 0.5 mg freshly mixed or set RealSeal, Activ GP, AH 26, and Kerr sealers were eluted with 200, 400, 800, and 1,200 microL cell culture medium for 24 and 72 hours. L929 cells were seeded into 96-well plates at  $3 \times 10^4$  cells/well and cultured with 100 microL eluate from each eluate group. Cells cultured with culture medium only served as a control. After 24 hours' incubation the cytotoxicity was evaluated by MTT assay. Cell viability was calculated as the percentage of the control

group, and the results were analyzed with 1-way analysis of variance. RESULTS: For the freshly mixed sealer, cell viability in the AH 26 group was less than in all of the other 3 sealer groups. The Kerr sealer group had greater cell viability than RealSeal and Activ GP groups. For the set sealer, cell viability in the AH 26 group was greater than in all of the other 3 groups. Cell viability in the RealSeal group was less than in the Kerr and Activ GP groups. CONCLUSION: Freshly mixed RealSeal and Activ GP sealers have lower cytotoxicity than AH 26 sealer and more cytotoxicity than Kerr sealer. When sealers are set, RealSeal sealer has more cytotoxicity than AH 26 and Kerr sealer. Activ GP sealer has more cytotoxicity than AH 26 and is similar to Kerr sealer.

Jafarnia B, Jiang J, He J, Wang YH, **Safavi KE**, Zhu Q. Evaluation of cytotoxicity of MTA employing various additives. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009 May;107(5):739-44.

OBJECTIVE: Various additives have been suggested to be used with MTA to improve its handling characteristics. The objective of this study was to evaluate the effects of various additives on cytotoxicity of MTA. STUDY DESIGN: Freshly mixed or set MTA pellet (1-mm diameter and 1-mm high cylinder) was prepared by mixing MTA with various additives. Additives tested included water, saline, 2% lidocaine, 5% CaCl(2), 3% NaOCl gel, and K-Y liquid. L929 cells were seeded into 96-well plates at  $3 \times 10^4$  cells per well and incubated with MTA pellets for 24 hours, 48 hours, and 72 hours. Cells without treatment served as a control group. Cell viability was evaluated by MTT assay and calculated as the percentage of the control group. The results were analyzed with 1-way ANOVA. RESULTS: For the set MTA, there were no significant cell viability differences ( $P > .05$ ) among the various additives at each tested time. For the freshly mixed MTA, 3% NaOCl gel has lower cell viability ( $P < .05$ ) than all the other groups. The cell viability of 3% NaOCl gel group was 29% to 50%. Gray and white MTA have similar results. CONCLUSION: This study shows that the various additives have no effect on the cytotoxicity of MTA when it becomes set. Also, all the tested additives, except 3% NaOCl gel, had no effect on the cytotoxicity of MTA when it was freshly mixed. The cytotoxicity of 3% NaOCl gel probably has no clinical significance considering there is still 29% to 50% of cell viability after cells were treated with MTA pellet in a 0.32-cm(2) culture well. MTA is biocompatible when mixed with the various additives.

Komabayashi T, D'souza RN, Dechow PC, **Safavi KE**, Spångberg LS. **Particle size and shape of calcium hydroxide.** J Endod. 2009 Feb;35(2):284-7.

The aim of this study was to examine the particle length, width, perimeter, and aspect ratio of calcium hydroxide powder using a flow particle image analyzer (FPIA). Five sample groups each with 10 mg of calcium hydroxide were mixed with 15 mL of alcohol and sonicated. Digital images of the particle samples were taken using the FPIA and analyzed with a one-way analysis of variance. The overall averages  $\pm$  standard deviation among the five groups for particle length (microm), width (microm), perimeter (microm), and aspect ratio were 2.255  $\pm$  1.994, 1.620  $\pm$  1.464, 6.699  $\pm$  5.598, and 0.737  $\pm$  0.149, respectively. No statistical significance was observed among the groups for all parameters. When the total of 46,818 particles from all five groups were classified into the five length categories of 0.5-microm increments, there were significant differences in width, perimeter, and aspect ratio (all p values  $< 0.0001$ ). In conclusion, calcium

hydroxide particles have a size and shape that may allow direct penetration into open dentin tubules.

Komabayashi T, Zhu Q, Jiang J, **Safavi KE**, Spångberg LS. **A rapid nondestructive method for root dentin moisture measurements: in vitro pilot study.** Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009 Mar;107(3):e107-11. Epub 2009 Jan 20.

Dentin moisture content is important in adhesive bonding and structural strength research; however, there is no rapid method available to assess dentin moisture without sample destruction. This study examined the use of a digital grain moisture meter to measure root dentin moisture in vitro. Extracted mandibular single-rooted teeth were sectioned at the CEJ. The moisture of the root dentin was measured at 6 measuring modes for different grains and repeated 5 times. Dentin weight changes before and after drying were measured to obtain control values. The control values were compared with machine readings. In conclusion, (1) each nondestructive measurement took less than 30 seconds, (2) 24 hours of storage at 37 degrees C and 100% humidity did not restore dentin moisture, and (3) 5 grain modes had a high validity and could be used for dentin moisture measurements.

**Shahi S, Rahimi S**, Hasan M, Shiezadeh V, Abdolrahimi M. **Sealing ability of mineral trioxide aggregate and Portland cement for furcal perforation repair: a protein leakage study.** J Oral Sci. 2009 Dec;51(4): 601-6.

The purpose of this study was to compare the sealing ability of gray mineral trioxide aggregate (GMTA), white MTA (WMTA), and both white and gray Portland cement as furcation perforation repair materials. A total of 120 human mandibular first molars were used. After root canal obturation and preparation of furcal perforations the specimens were randomly divided into four groups of 25 teeth each. In groups A, B, C, and D furcation perforations were filled with WMTA, GMTA, white Portland cement, and type II Portland cement, respectively. Ten teeth were used as positive controls with no filling materials in the perforations and 10 teeth with complete coverage with two layers of nail varnish were used as negative controls. A protein leakage model utilizing 22% bovine serum albumin (BSA) was used for evaluation. Leakage was noted when color conversion of the protein reagent was observed. The controls behaved as expected. Leakage was found in the samples from group A (WMTA), group B (GMTA), and in the two other groups (white and gray Portland cement). There were no statistically significant differences between GMTA and WMTA or white and gray Portland cement, but significant differences were observed between the MTA groups and the Portland cement groups. It was concluded that Portland cements have better sealing ability than MTA, and can be recommended for repair of furcation perforation if the present results are supported by other in vivo and in vitro studies.

**Shahi S, Yavari HR, Rahimi S, Reyhani MF**, Kamarroosta Z, Abdolrahimi M. **A comparative scanning electron microscopic study of the effect of three different rotary instruments on smear layer formation.** J Oral Sci. 2009 Mar;51(1):55-60.

The aim of this study was to evaluate the effect of RaCe, FlexMaster and ProFile rotary instruments on smear layer formation by scanning electron microscopy. Eighty-four caries-free freshly extracted human single-rooted teeth were selected and divided into three groups, each containing 28

teeth. The teeth were instrumented with rotary instruments sequentially: Group A: ProFile Rotary Instruments; Group B: FlexMaster Rotary Instruments; and Group C: RaCe Rotary Instruments. Instrumentation was performed by the crown-down method and according to the manufacturer's instructions. The specimens were then examined with SEM according to Hülsmann's classification. One-way ANOVA and a post hoc Tukey test were used for statistical analysis. The results showed that there were no statistically significant differences among the three groups in the coronal third ( $P = 0.39$ ), but at the apical and middle thirds there were statistically significant differences between the RaCe group and the other groups ( $P < 0.05$ ). Smear layer in the RaCe group was less than that in the ProFile and FlexMaster groups, but the difference between the ProFile group and FlexMaster group was not statistically significant ( $P > 0.05$ ). It was concluded that RaCe Rotary Instruments produce less smear layer than FlexMaster and ProFile Rotary Instruments.

Rad M, Haghani J, **Shahravan A**, Khosravifar A. **Qualitative assessment of the dental health services provided at a dental school in Kerman, Iran.** Braz Oral Res. 2009 Oct-Dec;23(4):377-80.

Increasing the quality of the services provided in a Dental School can raise the satisfaction level of patients and consequently increase the level of their oral health. This study was conducted to evaluate the quality of dental care and services provided to patients referred to a Dental School in Kerman, Iran. In this qualitative study, face-to-face, in-depth interviews were conducted with 41 participants [25 patients (P), 5 nurses (N), 6 dental academic staff (AS), and 5 dental students (S)]. Then, the interviews were transcribed and analyzed, using content analysis of data. Data analysis in qualitative research involves breaking down the data and searching for codes and categories that are then reassembled to form themes. Both positive and negative themes emerged. Positive themes included: good infection control, service accessibility, patient appointments and visits were not assigned on merit, precise examinations, and comprehensive treatment plans. Negative themes included: long wait time, lack of options to pass waiting time, such as newspapers and television, an insufficient number of nurses, and not enough professors for supervision. In addition, the results of this study show that the patients and dental staff have high expectations in relation to dental services, and that implementation of these expectations would increase the overall satisfaction with and the quality of the level of services. Finally, some recommendations for improving services in the Kerman Dental School were given to the managing team of the Dental School.

**Sheikh-Nezami M**. **Emergency treatment for horizontal root fractures.** Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009 Nov;108(5):645; author reply 645-6.

**Sheikh-Nezami M**, Mokhber N, Shamsian Kh, Saket S. **Management of a midroot and complicated crown fracture: a case report.** Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009 May;107(5):e65-7.

This case report illustrates the management of a permanent right central maxillary incisor with midroot fracture and complicated crown fracture, which was treated by cervical pulpotomy and fixation of the fragments. After 4-month follow-up, radiography showed healing with interproximal bone and connective tissue at the fracture line at midroot.

After 3 years, the tooth was still functional without any clinical sign and symptom.

**Shokouhinejad N. Root canal re-treatment of a mandibular second premolar with three root canals: a case report.** Aust Endod J. 2009 Dec;35(3):180-2.

Accurate diagnosis of root canal morphology and anatomy is essential for thorough shaping and cleaning of the entire root canal system and consequent successful root canal treatment. Mandibular premolars show a wide variety of root canal anatomy. This paper describes a case of mandibular second premolar with three root canals that has previously received an incomplete root canal treatment.

Garber SE, **Shabahang S**, Escher AP, **Torabinejad M**. **The effect of hyperglycemia on pulpal healing in rats.** J Endod. 2009 Jan;35(1):60-2. Epub 2008 Nov 4.

Diabetes mellitus (DM) may impede healing of dental pulps. In this study, the effect of hyperglycemia on pulpal healing was determined in exposed rat pulps capped with mineral trioxide aggregate. Two groups of 11 rats received injections of saline (control group) or streptozotocin to induce hyperglycemia (DM group). The pulps of the maxillary first molars of all rats were exposed and capped. Intact teeth and teeth with exposed pulps without restorations served as positive and negative controls, respectively. Histologic samples were prepared and evaluated for dentin bridge formation and pulpal inflammation. Data were analyzed by using Fisher exact, Mann-Whitney U, and Spearman correlation tests. Dentin bridge formation was inhibited in diabetic rats ( $p = 0.029$ ) along with more inflammation in these pulps ( $p = 0.005$ ). There was an inverse association between dentin bridge formation and inflammatory cell infiltration ( $p = 0.001$ ). Based on these results, it appears that hyperglycemia adversely affects pulpal healing in rats.

Garber SE, **Shabahang S**, Escher AP, **Torabinejad M**. **The effect of hyperglycemia on pulpal healing in rats.** J Endod. 2009 Jan;35(1):60-2. Epub 2008 Nov 4.

Diabetes mellitus (DM) may impede healing of dental pulps. In this study, the effect of hyperglycemia on pulpal healing was determined in exposed rat pulps capped with mineral trioxide aggregate. Two groups of 11 rats received injections of saline (control group) or streptozotocin to induce hyperglycemia (DM group). The pulps of the maxillary first molars of all rats were exposed and capped. Intact teeth and teeth with exposed pulps without restorations served as positive and negative controls, respectively. Histologic samples were prepared and evaluated for dentin bridge formation and pulpal inflammation. Data were analyzed by using Fisher exact, Mann-Whitney U, and Spearman correlation tests. Dentin bridge formation was inhibited in diabetic rats ( $p = 0.029$ ) along with more inflammation in these pulps ( $p = 0.005$ ). There was an inverse association between dentin bridge formation and inflammatory cell infiltration ( $p = 0.001$ ). Based on these results, it appears that hyperglycemia adversely affects pulpal healing in rats.

**Torabinejad M**, Corr R, Handysides R, **Shabahang S**. **Outcomes of nonsurgical retreatment and endodontic surgery: a systematic review.** J Endod. 2009 Jul;35(7):930-7.

**INTRODUCTION:** The purpose of this systematic review was to compare the clinical and radiographic outcomes of

nonsurgical retreatment with those of endodontic surgery to determine which modality offers more favorable outcomes.

**METHODS:** The study began with targeted electronic searches of MEDLINE, PubMed, and Cochrane databases, followed with exhaustive hand searching and citation mining for all articles reporting clinical and/or radiographic outcomes for at least a mean follow-up of 2 years for these procedures. Pooled and weighted success rates were determined from a meta-analysis of the data abstracted from the articles. **RESULTS:** A significantly higher success rate was found for endodontic surgery at 2-4 years (77.8%) compared with nonsurgical retreatment for the same follow-up period (70.9%;  $P < .05$ ). At 4-6 years, however, this relationship was reversed, with nonsurgical retreatment showing a higher success rate of 83.0% compared with 71.8% for endodontic surgery ( $P < .05$ ). Insufficient numbers of articles were available to make comparisons after 6 years of follow-up period. Endodontic surgery studies showed a statistically significant decrease in success with each increasing follow-up interval ( $P < .05$ ). The weighted success for 2-4 years was 77.8%, which declined at 4-6 years to 71.8% and further declined at 6+ years to 62.9% ( $P < .05$ ). Conversely, the nonsurgical retreatment success rates demonstrated a statistically significant increase in weighted success from 2-4 years (70.9%) to 4-6 years (83.0%;  $P < .05$ ). **CONCLUSIONS:** On the basis of these results it appears that endodontic surgery offers more favorable initial success, but nonsurgical retreatment offers a more favorable long-term outcome.

Baker TF, **Torabinejad M**, Schwartz SF, Wolf D. **Effect of intraosseous anesthesia on control of hemostasis in pigs.** J Endod. 2009 Nov;35(11):1543-5. Epub 2009 Sep 20.

**INTRODUCTION:** Intraosseous anesthesia is used to deliver anesthetic into cancellous bone adjacent to the root apices. No study has assessed the effect of this anesthetic technique on hemostasis. The purpose of this study was to compare the amount of bleeding from soft tissue and bone in pig jaws after preoperative intraosseous or infiltration anesthesia with 2% lidocaine containing 1:50,000 epinephrine. **METHODS:** Twelve pigs were divided into 3 groups. The first group received infiltration anesthesia on one half of the jaw and no anesthesia on the other half. The second group received intraosseous anesthesia on one half of the jaw and no anesthesia on the other half. The third group received infiltration anesthesia on one half of the jaw and intraosseous anesthesia on the second half. Blood was collected during flap reflection to measure the volume of soft tissue bleeding. Osteotomies were then prepared with blood collected from the surgical site to measure the volume of osseous bleeding. **RESULTS:** The median soft tissue blood loss observed in animals receiving infiltration anesthesia (1.14 mL) was significantly less as compared with animals that received no anesthesia (4.49 mL) or intraosseous anesthesia (2.45 mL). Compared with median hard tissue blood loss observed in animals without anesthesia (1.51 mL), significantly less blood loss was observed in animals receiving either infiltration anesthesia (0.67 mL) or intraosseous anesthesia (0.76 mL). **CONCLUSIONS:** Infiltration anesthesia resulted in significantly less soft tissue bleeding ( $p = .004$ ) as compared with no anesthesia. Infiltration and intraosseous anesthesia resulted in significantly less osseous bleeding than the use of no anesthetic ( $p < .001$ ). The volume of blood loss for each animal was shown to be below the maximum safe volume of blood loss for a single procedure.

**Torabinejad M,** Corr R, Handysides R, **Shabahang S.** **Outcomes of nonsurgical retreatment and endodontic surgery: a systematic review.** J Endod. 2009 Jul;35(7):930-7.

**INTRODUCTION:** The purpose of this systematic review was to compare the clinical and radiographic outcomes of nonsurgical retreatment with those of endodontic surgery to determine which modality offers more favorable outcomes. **METHODS:** The study began with targeted electronic searches of MEDLINE, PubMed, and Cochrane databases, followed with exhaustive hand searching and citation mining for all articles reporting clinical and/or radiographic outcomes for at least a mean follow-up of 2 years for these procedures. Pooled and weighted success rates were determined from a meta-analysis of the data abstracted from the articles. **RESULTS:** A significantly higher success rate was found for endodontic surgery at 2-4 years (77.8%) compared with nonsurgical retreatment for the same follow-up period (70.9%;  $P < .05$ ). At 4-6 years, however, this relationship was reversed, with nonsurgical retreatment showing a higher success rate of 83.0% compared with 71.8% for endodontic surgery ( $P < .05$ ). Insufficient numbers of articles were available to make comparisons after 6 years of follow-up period. Endodontic surgery studies showed a statistically significant decrease in success with each increasing follow-up interval ( $P < .05$ ). The weighted success for 2-4 years was 77.8%, which declined at 4-6 years to 71.8% and further declined at 6+ years to 62.9% ( $P < .05$ ). Conversely, the nonsurgical retreatment success rates demonstrated a statistically significant increase in weighted success from 2-4 years (70.9%) to 4-6 years (83.0%;  $P < .05$ ). **CONCLUSIONS:** On the basis of these results it appears that endodontic surgery offers more favorable initial success, but nonsurgical retreatment offers a more favorable long-term outcome.

**Torabinejad M,** Pitt Ford TR, McKendry DJ, Abedi HR, Miller DA, Kariyawasam SP. **Histologic assessment of mineral trioxide aggregate as a root-end filling in monkeys.** 1997. Int Endod J. 2009 May;42(5):408-11.

**Zarei M, Shahrami F, Vatanpour M.** **Comparison between gutta-percha and Resilon retreatment.** J Oral Sci. 2009 Jun;51(2):181-5.

Retreatment procedures in endodontic practice require complete removal of the original root filling materials. The aim of this study was to compare the amount of residual filling material on the walls of root canals that were obturated with gutta-percha or Resilon. Thirty extracted single-rooted human teeth were selected and instrumented by RaCe rotary instruments up to MAF #35. They were randomly divided into two groups of 15 teeth each. Group 1 was obturated with gutta-percha and AH26 sealer and group 2 was obturated with the Resilon/Epiphany system by lateral condensation technique. All canals were then retreated using Gates-Glidden drills, MAF #40 and chloroform. The teeth were split longitudinally and photographs were taken by a digital camera connected to a stereomicroscope and then samples were analyzed. The amount of residual material and time of retreatment were determined in each group at three levels in the canal. Data were analyzed by Mann-Whitney and Friedman tests. The Resilon group had significantly more residual material in the canal than the Gutta-percha group ( $P = 0.009$ ). According to the level of the canal, the differences were statistically significant ( $P = 0.013$ ) only in the Resilon group. Time required for retreatment in the two groups was not significantly different ( $P = 0.381$ ). Orthograde retreatment of Resilon was less efficient than that of gutta-percha.