

**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)**

Chen E, **Abbott PV**. **Evaluation of accuracy, reliability, and repeatability of five dental pulp tests.** *J Endod.* 2011;37(12):1619-23.

**Introduction:** The aim of this study was to compare the clinical accuracy, reliability, and repeatability of laser Doppler flowmetry (LDF), an electric pulp test (EPT), and various thermal pulp sensibility tests.

**Methods:** Pulp tests were done on 121 teeth in 20 subjects by using LDF, EPT, and thermal pulp testing (CO(2), Endo Frost [EF], Ice) during 2 or 3 test sessions with at least 1-week intervals. The order of testing was reversed on the second visit. A laser Doppler flowmeter was used to measure mean pulp blood flow (Flux) calibrated against a brownian motion medium and zeroed against a static reflector. The laser source was 780 nm, with 0.5-mm fiber separation in the probe, 3.1 kHz as the primary bandwidth for filter set to 0.1-second time output constant. Customized polyvinylsiloxane splints were fabricated for each participant, and a minimum of 90-second recording time was used for each tooth. Raw data were analyzed by using repeated measure analysis of variance, pairwise comparisons, and interclass correlations (ICC).

**Results:** The accuracy of EPT, CO(2), and LDF tests was 97.7%, 97.0%, and 96.3%, respectively, without significant differences ( $P > .3$ ). Accuracy of EF and Ice was 90.7% and 84.8%, respectively. EPT ( $P=.015$ ) and CO(2) ( $P=.022$ ) were significantly more accurate than EF. LDF was more accurate than EF, but this was not statistically significant ( $P=.063$ ). Ice was significantly less accurate than EPT ( $P=.004$ ), CO(2) ( $P=.005$ ), LDF ( $P=.006$ ), and EF ( $P=.019$ ). With the exception of Ice (effect of visit:  $F(2,38) = 5.67$ , mean squared error = 0.01,  $P=.007$ ,  $\eta(2)(p) = 0.23$ ), all tests were reliable. Ice (ICC=0.677) and LDF (ICC=0.654) were the most repeatable of the tests, whereas EPT (ICC=0.434) and CO(2) (ICC=0.432) were less repeatable.

**Conclusions:** CO(2), EPT, and LDF were reliable and the most accurate tests, but CO(2) and EPT were less repeatable yet less time-consuming than LDF. EF was reliable but not as accurate as EPT and CO(2) and less repeatable than Ice and LDF. Ice was the most repeatable but the least accurate and least reliable test.

Huang B, Inagaki K, Yoshii C, Kano M, **Abbott PV**, Noguchi T, Takahashi K, Bessho K. **Social nicotine dependence in Australian dental undergraduate students.** *Int Dent J.* 2011;61(3):152-6. doi: 10.1111/j.1875-595X.2011.00032.x.

**Objectives:** This study aimed to investigate dental undergraduate students' tobacco usage and social nicotine dependence in Australia. A special interest was

to identify the role of factors such as age, gender, year of dental education and cohabitants' smoking status for social nicotine dependence.

**Materials and methods:** A sample of 252, first-to-fifth year undergraduate students in an Australian dental school was used. Each completed a self-administered questionnaire.

**Results:** The smoking rate was 4.8%. Current smokers displayed higher social nicotine dependence than those that had never smoked ( $t=3.1$ ,  $df=244$ ,  $P=0.002$ ). Dental undergraduate students that showed higher social nicotine dependence ( $P=0.001$ , OR=1.3, 95% CI: 1.1-1.6), or that had smoking cohabitants ( $P=0.016$ , OR=4.8, 95% CI: 1.3-17.0), were more likely to smoke. Students' social nicotine dependence increased with year of dental study ( $P=0.043$ ,  $\beta=0.4$ ,  $t=2.0$ ). Social nicotine dependence enhanced tobacco usage among Year-1-to-4 students ( $P=0.005$ , OR=1.4, 95% CI: 1.1-1.7) but not Year-5 undergraduates ( $P=0.432$ ).

**Conclusions:** Social nicotine dependence has become a developing issue in dental education. Tobacco control should be highlighted in the dental curriculum. Future investigations into the effects of dental education on social nicotine dependence and tobacco usage are indicated.

**Asgary S**. **Calcium-enriched mixture pulpotomy of a human permanent molar with irreversible pulpitis and condensing apical periodontitis.** *J Conserv Dent.* 2011;14(1):90-3.

This case report describes a pulpotomy treatment of a permanent mature molar tooth with established irreversible pulpitis and condensing apical periodontitis, using calcium-enriched mixture (CEM) cement. Clinical examination revealed that the first right lower molar had a large carious lesion with history of spontaneous/lingering pain; radiographic examination showed condensing apical periodontitis. Pulpotomy was opted as the treatment; cervical pulpotomy was carried out. Following hemostasis, the radicular pulp stumps were covered with ~2-mm-thick layer of the prepared CEM cement; the tooth was restored with amalgam. Two-year follow-up showed that the treated tooth had been symptomless, and there were no clinical signs/symptoms of either inflammation or infection. Radiographically, the periradicular lesion was completely healed with reconstruction of bone structures to normal appearance; the root canals were not calcified. According to chemical, physical, and biological properties of the CEM cement, this novel biomaterial may be suitable for endodontic treatment.

**Asgary S**, Ahmadyar M. **Can miniature pulpotomy procedure improve treatment outcomes of direct pulp**

**capping?** MMed Hypotheses. 2011 Nov 30  
Dental pulp exposure is a common incident during dental treatment. If there are clinical signs of pulp vitality, it is recommended to carry out direct pulp capping (DPC) using appropriate pulp covering agents (PCA). The main objectives are maintenance of pulp vitality/healing along with the formation of a calcified bridge beneath the PCA. Our proposed hypothesis is based on consideration of biologic principles in order to achieve improved treatment outcomes of DPC for curiously exposed pulp using miniature pulpotomy procedure (MPP). MPP will result in improved treatment outcomes of DPC by improved maintenance of a clean surgical pulp wound; removal of infected dentin chips/damaged pulp tissue specially injured odontoblast cells; improved proximity/interaction of PCA to undifferentiated mesenchymal/stem cells; better control of bleeding; and creating an improved seal using PCA.

**Asgary S, Nosrat A, Seifi A. Management of inflammatory external root resorption by using calcium-enriched mixture cement: a case report.** J Endod. 2011;37(3):411-3.

**Introduction:** Inflammatory external root resorption is one of the major complications after replantation of avulsed teeth. Here we report a case of inflammatory external root resorption in a maxillary left central incisor in an 11-year old male patient that was managed and treated by using calcium enriched mixture (CEM) cement.

**Methods:** The patient's chief complaint was mobility of avulsed and replanted maxillary left central incisor and pain in chewing on left central and lateral incisors. Radiographic examination showed progressive inflammatory external root resorption of the left central incisor with an inadequately obturated root canal treatment. Both teeth were immature and had periapical radiolucencies. Both teeth were irrigated copiously with 2.5% NaOCl and obturated with CEM cement. However, the central incisor was treated with calcium hydroxide 6 weeks before CEM cement obturation.

**Results:** The clinical and radiographic examinations at 3-, 6-, 12-, 24-, and 40-month follow-up showed that treated teeth were functional with normal mobility, the progression of the inflammatory external root resorption ceased, the resorptive lacunae were filled with newly formed bone, and periapical radiolucencies healed.

**Conclusions:** Considering the biological properties of CEM cement, especially its alkalinity and sustained calcium hydroxide release, using this novel cement for treatment of inflammatory external root resorption and obturation of immature necrotic teeth might be an applicable choice.

Malekafzali B, Shekarchi F, **Asgary S. Treatment outcomes of pulpotomy in primary molars using two endodontic biomaterials. A 2-year randomised clinical trial.** Eur J Paediatr Dent. 2011;12(3):189-193.

**Aim:** To compare the treatment outcomes of calcium-enriched mixture (CEM) cement and mineral trioxide aggregate (MTA) as pulp dressing biomaterials in vital

pulpotomy of carious primary molars. Study design: split-mouth randomised clinical trial.

**Materials and methods:** Forty children aged 4-8 years with 2 carious teeth requiring pulpotomy were selected and randomly assigned to MTA (n. 40) or CEM (n. 40) groups. After coronal pulp removal, the remaining radicular pulp was covered with an appropriate biomaterial; the teeth were then permanently restored. Clinical/radiographic success/failures were blindly evaluated at 6-, 12- and 24-month follow-ups. Statistics: the recorded data were analyzed with McNemar test and GEE.

**Results:** A total of 36, 33 and 35 patients were available for 6-, 12- and 24- month follow-ups, respectively. At the 12-month follow-up only one and three teeth in the CEM and MTA groups had pathologic external root resorption, respectively. The resorbed teeth were then missed due to extraction/exfoliation at the 24- month follow-up; all other treated teeth were sign/symptom-free. Overall, clinical and radiographic outcomes in both MTA/CEM groups were comparable at the three follow-ups without significant differences. Time had no significant effect on the success.

**Conclusion:** MTA and CEM demonstrated favourable treatment outcomes for pulpotomy of carious primary molars; CEM may be an effective pulp dressing biomaterial.

**Bidar M, Disfani R, Gharagozlo S, Rouhani A, Forghani M. Effect of previous calcium hydroxide dressing on the sealing properties of the new endodontic cement apical barrier.** Eur J Dent. 2011;5(3):260-4.

**Introduction:** Using the fluid filtration method, an *in vitro* study was conducted to evaluate the effects of medication with calcium hydroxide on the sealing ability of the New Endodontic Cement (NEC) apical barrier in the short and long terms.

**Methods:** Fifty extracted single rooted teeth were prepared and apical resorption produced using acid sulfuric for four days. The teeth were randomly divided into two experimental groups (n=20) and two control groups. In group 1, calcium hydroxide was placed into all canals for one week and in group 2, no medication was used. In both groups, a 4 mm NEC apical plug was placed in the canals and the remaining portion of the canals was filled with gutta-percha. The amount of microleakage of all samples was evaluated after one week and three months. The data were statistically analyzed using two-way ANOVA.

**Results:** There was no significant difference between the two groups in either time period (P>.05). In both group 1 and group 2, microleakage increased after three months but this increase was not statistically significant (P>.05).

**Conclusions:** According to the result of this study, medication with calcium hydroxide had no adverse effect on the short- and long-term sealing properties of an NEC apical plug.

**Dadresanfar B, Khalilak Z, Delvarani A, Mehrvarzfar**

**P. Vatanpour M, Pourasadollah M. Effect of ultrasonication with EDTA or MTAD on smear layer, debris and erosion scores.** J Oral Sci. 2011;53(1):31-6.

The purpose of this study was to compare the effects of ultrasonication with ethylenediaminetetraacetic acid (EDTA) and a mixture of tetracycline isomer, an acid, and a detergent (MTAD) as final canal irrigants on the smear layer, debris and erosion scores. Fifty-eight extracted single-rooted human teeth were instrumented with ProTaper rotary files up to size F3. According to the final irrigation regimen, the samples were distributed into the following groups: EDTA, MTAD, EDTA ultrasonicated for 1 min, and MTAD ultrasonicated for 1 min. The smear layer, debris and erosion scores were recorded at the apical, middle, and coronal third of each canal using a scanning electron microscope. Data were subjected to statistical evaluation using the Kruskal-Wallis and Mann-Whitney tests ( $P < 0.05$ ). There were no significant differences in smear layer or debris removal between the experimental groups. EDTA caused significantly more erosion at the middle level than MTAD. Also EDTA resulted in more erosion at the coronal level than MTAD when subjected to ultrasonication. Ultrasonic activation of EDTA significantly increased its erosive effects at the middle and coronal levels. Based on the present findings, MTAD appears to cause less dentinal erosion while allowing proper removal of the smear layer and debris.

**Farhad AR, Razavi SM, Nejad PA. The use of aminoguanidine, a selective inducible nitric oxide synthase inhibitor, to evaluate the role of nitric oxide on periapical healing.** Dent Res J (Isfahan). 2011 Oct;8(4):197-202.

**Background:** Nitric oxide (NO) is one of the many chemical mediators involved in inflammatory processes. In addition to periapical inflammation, NO can have a role in periapical healing. The purpose of this study was to evaluate the effect of aminoguanidine (AG) as a selective inhibitor of inducible nitric oxide synthase (iNOS) on the degree of healing response of periapical lesions of the canine teeth of cats.

**Methods:** In this interventional experimental study, the root canals of 48 cat canine teeth were infected with cat dental plaque and sealed. After induction of periapical lesions, root canal therapy (RCT) was performed. On the day of RCT phase, the cats were administered either AG (experimental group) or normal saline (control group), which was continued on a daily basis until the day of sacrifice. Four canine teeth in one cat served as negative and positive controls. The animals were sacrificed 6 weeks after RCT. The healing response of the periapical zones was analyzed histologically. The mean scores of healing for the two groups were compared using Mann-Whitney U test.

**Results:** The mean scores of healing for the AG group ( $2.45 \pm 0.508$ ) were significantly higher than those of the control group ( $2 \pm 0.510$ ) ( $P < 0.05$ ).

**Conclusion:** The use of an iNOS selective inhibitor such as AG can accelerate the healing process in periapical lesions.

**Farhad AR, Razavi S, Jahadi S, Saatchi M. Use of aminoguanidine, a selective inducible nitric oxide synthase inhibitor, to evaluate the role of nitric oxide in periapical inflammation.** J Oral Sci. 2011;53(2):225-30.

The purpose of this study was to evaluate the effects of aminoguanidine (AG) as a selective inhibitor of inducible nitric oxide synthase (iNOS) on the degree of inflammatory response in periapical lesions in the canine teeth of cats. Root canals from 52 cat canine teeth were exposed to the oral cavity and sealed after 7 days. One day before pulp exposure, cats were administered either AG (experimental group) or normal saline (control group), which was continued on a daily basis until the day of sacrifice. Animals were sacrificed at 28 days after pulp exposure. Inflammatory response in the periapical zones was analyzed histologically. The degree of periapical inflammation in the AG group was significantly lower than that in the control group ( $P < 0.05$ ). Selective iNOS inhibitors such as AG thus reduce the intensity of inflammatory responses in periapical lesions.

**Farhad AR, Hasheminia S, Razavi S, Feizi M. Histopathologic evaluation of subcutaneous tissue response to three endodontic sealers in rats.** J Oral Sci. 2011;53(1):15-21.

The aim of this study was to evaluate the subcutaneous biocompatibility of three root canal sealers in rats. Thirty Wistar rats were divided into three groups according to three time periods (15, 30 and 60 days). Sterilized polyethylene tubes filled with root canal sealers (AH Plus, Epiphany & Grossman), and one empty tube (control) were implanted into four separate dorsal regions in each rat. At the end of each study period, 10 animals were sacrificed, and histologic sections of connective tissue at the open ends of the tubes were prepared. Severity of tissue inflammatory response was assessed. Grossman endodontic sealer had the most severe inflammatory response followed by the AH Plus, Epiphany and control groups. The tissue inflammatory response of the Epiphany and AH Plus sealers was not significantly different. Thus, Epiphany sealer showed acceptable biocompatibility when tested on rat subcutaneous tissue.

**Habibi M, Ghoddusi J, Habibi A, Mohtasham N. Healing process following application of set or fresh mineral trioxide aggregate as a root-end filling material.** Eur J Dent. 2011;5(1):19-23.

**Introduction:** An unsuccessful attempt to reach the apical area or to place the retrograde material is a major difficulty in periradicular surgery. The aim of this study was to compare the histological evaluation of the healing process following an orthograde versus a retrograde application of mineral trioxide aggregate (MTA) as a root-end filling material during apical surgery on cats'

teeth in order to find out whether orthograde placement of MTA before surgery can be used instead of retrograde placement during surgery.

**Methods:** In this experimental study, 24 canine teeth in 12 mature and healthy cats were filled with either MTA or gutta-percha in an orthograde manner. Two weeks later, the teeth with MTA were surgically exposed and resected to the set-MTA within the canals. The teeth previously filled by gutta-percha were also surgically exposed, and retrograde cavities were prepared at the root ends and filled with fresh-MTA. After 8 weeks, the animals were euthanized by vital perfusion. Six-micron histological slices were prepared from samples, stained by Hematoxylin & Eosin, and histologically studied by means of a light microscope. The collected data was analyzed by the Chi-square and the T-test.

**Results:** One of the samples in the fresh-MTA group was omitted during processing because of inappropriate sectioning. In the set-MTA group, 5 out of 12 showed chronic abscess, while in the fresh-MTA group, 2 out of 11 were discovered to have chronic abscess; however, no significant difference was observed ( $P>.05$ ). Hard tissue healing (cementum, bone, cementum + bone formation) in the set-MTA and fresh-MTA groups were 7 out of 12 and 9 out of 11, respectively. While healing seemed more likely to occur in the fresh-MTA group, the difference was statistically insignificant ( $P>.05$ ). The magnitude of bone, cementum, or bone and cementum formation showed slight differences between the two groups; however, the figures failed to show any marked differences ( $P>.05$ ).

**Conclusions:** Orthograde placement of MTA could be used as an obturation material before surgery. In this way, after root-end resection, there would be no need for root-end preparation and filling procedures.

**Danesh F, Karamifar K, Abbott PV. Management of an extensive invasive root resorptive lesion with mineral trioxide aggregate: a case report.** J Oral Sci. 2011;53(3):397-401.

External invasive resorption is an uncommon but aggressive type of external resorption. This report outlines the management of an advanced case of external invasive resorption with mineral trioxide aggregate (MTA). The clinical and radiographic follow-up after 60 months revealed a functional tooth with a stable periodontal condition and no evidence of any further resorption.

**Khedmat S, Seyedabadi M, Ghahremani MH, Ostad SN. Cyclooxygenase 2 plays a role in Emdogain-induced proliferation.** J Periodontal Res. 2011;46(1):67-73. doi: 10.1111/j.1600-0765.2010.01313.x.

**Background and objective:** Enamel matrix proteins are involved in the development and regeneration of root cementum and in its attachment to dentin; however, the mechanisms through which this occurs have yet to be elucidated. The present study was therefore carried out to evaluate the mitogenic and proliferative responses of human periodontal fibroblast (HPLF) cells to Emdogain

(EMD), and the potential role of cyclooxygenase 2 (COX-2) in this process.

**Material and methods:** We investigated the effects of EMD on 5-bromo-2'-deoxyuridine (BrdU) incorporation, colchicine freezing of mitosis, XTT [2,3-bis(2-methoxy-4-nitro-5-sulphophenyl)-2H-tetrazolium-5-carboxanilide] reduction and Trypan Blue dye exclusion, with or without celecoxibe, a selective cyclooxygenase-2 (COX-2) inhibitor; we also evaluated the expression of COX-2 mRNA and COX-2 protein in response to EMD.

**Results:** EMD significantly enhanced mitosis in, and proliferation of, human periodontal ligament fibroblasts in a dose-dependent manner; however, there was a small increase of DNA synthesis only in response to a high dose of EMD (200 µg/mL). EMD (100 and 200 µg/mL) elicited an increase in COX-2 expression ( $p\leq 0.05$ ). Celecoxibe (20 µm) diminished the EMD-induced mitosis and proliferation of HPLF cells ( $p\leq 0.05$ ).

**Conclusion:** Celecoxibe hampered EMD-induced mitosis and proliferation, which, in association with EMD-increased COX-2 expression, indicates that COX-2 may be involved in the proliferative response of HPLF cells to EMD.

**Lotfi M, Vosoughhosseini S, Saghiri MA, Zand V, Yavari HR, Kimyai S, Mehdipour M, Ranjkesh B, Mokhtari H, Salemmilani A, Doosti S. Effect of alkaline pH on sealing ability of white mineral trioxide aggregate.** Med Oral Patol Oral Cir Bucal. 2011;16(7):e1014-6.

**Objectives:** The aim of this study was to evaluate microleakage of white mineral trioxide aggregate (WMTA) after its exposure to a range of alkaline environments during hydration. **Study Design:** Seventy single-rooted teeth were divided into 4 experimental and 2 control groups. All the teeth were instrumented, and their apices were resected. Root-end cavities were filled with WMTA in the experimental groups. In the control groups, root-end cavities were not filled. Root-end fillings were exposed to alkaline environments with pH values of 7.4, 8.4, 9.4, or 10.4 for 3 days. Microleakage was evaluated by bovine serum albumin. Evaluations were carried out at 24-hour intervals for 80 days. Data were analyzed by one-way analysis of variance and a post hoc Tukey test at the 0.05 level of confidence. **Results:** The number of days (mean ± standard deviation) needed for color change at pH values of 7.4, 8.4, 9.4, and 10.4 were  $78.53 \pm 5.68$ ,  $80.00 \pm 0.00$ ,  $68.93 \pm 19.00$ , and  $34.46 \pm 12.73$ , respectively. The time needed for leakage to occur was significantly shorter in samples stored at a pH value of 10.4 ( $P<0.001$ ). **Conclusions:** Within the limits of this study, it can be concluded that pH values greater than 9.4 may jeopardize the sealing ability of WMTA during hydration.

Vosoughhosseini S, **Lotfi M**, Shahmoradi K, **Saghiri MA, Zand V**, Mehdipour M, Ranjkesh B, **Mokhtari H, Salemmilani A**, Doosti S. **Microleakage comparison of glass-ionomer and white mineral trioxide aggregate**

used as a coronal barrier in nonvital bleaching. Med Oral Patol Oral Cir Bucal. 2011;16(7):e1017-21.

Objectives: There is some evidence that the pH at the root surface is reduced by intracoronal placement of bleaching pastes, which is known to enhance osteoclastic activity. Therefore, it is recommended that a protective barrier be used over the canal filling to prevent leakage of bleaching agents. Glass-ionomer (GI) is commonly used as a coronal barrier before nonvital bleaching. Because mineral trioxide aggregate (MTA) creates high alkalinity after mixing with water, using MTA as a protective barrier over the canal filling may not only prevent leakage of bleaching agents and microorganisms, but may prevent cervical resorption. The aim of this study was to evaluate sealing ability of white mineral trioxide aggregate (WMTA) as a coronal barrier before nonvital bleaching.

Study design: Root canals of one hundred thirty human maxillary incisors were instrumented and filled with gutta-percha without sealer. Gutta-percha was removed up to 3 mm below the cemento-enamel junction (CEJ). The teeth were randomly divided into six experimental groups of 20 teeth each and two control groups of 5. In three experimental groups, WMTA was packed into the canal to the level of CEJ. In the remaining experimental groups, glass-ionomer (GI) was used as a coronal barrier. After a 24-hour incubation period, one of the following three bleaching agents was placed in the access cavity of each of the WMTA or GI groups. These three bleaching agents were 30% hydrogen peroxide, sodium perborate mixed with 30% hydrogen peroxide, and sodium perborate mixed with distilled water. The bleaching agents were replaced every 3 days for three times. In the positive controls, no coronal barrier was used. In the negative controls, all the tooth surfaces were covered by two layers of nail varnish. Microleakage was evaluated using protein leakage test. Statistical analyses were performed with the Kruskal-Wallis and Mann-Whitney tests.

Results: The experimental groups showed minimum leakage which was not significantly more than that in the negative controls. There was no statistically significant difference in leakage between the experimental groups ( $p < 0.05$ ).

Conclusions: This study indicated that different bleaching agents have no effect on sealing ability of WMTA.

**Mehrvarzfar P, Abbott PV, Saghiri MA, Delvarani A, Asgar K, Lotfi M, Karamifar K, Kharazifard MJ, Khabazi H. Effects of three oral analgesics on postoperative pain following root canal preparation: a controlled clinical trial.** Int Endod J. 2011. doi: 10.1111/j.1365-2591.2011.01950.x.

Abstract: Aim To compare the effects of single doses of three oral medications on postoperative pain following instrumentation of root canals in teeth with irreversible pulpitis.

Methodology: In this double-blind clinical trial, 100 patients who had anterior or premolar teeth with

irreversible pulpitis without any signs and symptoms of acute or chronic apical periodontitis and moderate to severe pain were divided by balanced block random allocation into four groups of 25 each, a control group receiving a placebo medication, and three experimental groups receiving a single dose of either Tramadol (100 mg), Novafen (325 mg of paracetamol, 200 mg ibuprofen and 40 mg caffeine anhydrous) or Naproxen (500 mg) immediately after the first appointment where the pulp was removed, and the canals were fully prepared. The intensity of pain was scored based on 10-point VAS before and after treatment for up to 24 h postoperatively. Data were submitted to repeated analysis of variance.

Results: At the 6, 12 and 24 h postoperative intervals after drug administration, the intensity of pain was significantly lower in the experimental groups than in the placebo group ( $P < 0.01$ ). Tramadol was significantly less effective ( $P < 0.05$ ) than Naproxen, and Novafen that were similar to each other ( $P > 0.05$ ).

Conclusion: A single oral dose of Naproxen, Novafen and Tramadol taken immediately after treatment reduced postoperative pain following pulpectomy and root canal preparation of teeth with irreversible pulpitis.

**Mehrvarzfar P, Saghiri MA, Asaturian A, Fekrazad R, Karamifar K, Eslami G, Dadresanfar B. Additive effect of a diode laser on the antibacterial activity of 2.5% NaOCl, 2% CHX and MTAD against Enterococcus faecalis contaminating root canals: an *in vitro* study.** J Oral Sci. 2011;53(3):355-60.

This *in vitro* study was performed to evaluate the effect of a diode laser and common disinfectants used in combination on mono-infected dental canals. One hundred and six single-rooted human premolars were prepared and contaminated with *Enterococcus faecalis*. After two weeks of incubation, samples were divided into two experimental groups ( $n=48$ ) and two control groups ( $n=5$ ). In the first group, the teeth were rinsed for 5 min with either sterile saline, 2.5% NaOCl, or MTAD, or for 1 min with 2% chlorhexidine gluconate (CHX). In the other group, samples were additionally irradiated with a 810-nm diode laser at 2 W output for  $5 \times 5$  s. Intracanal bacterial sampling was done, and the samples were plated to determine the CFU count. In the first group, 2.5% NaOCl was as effective as 2% CHX and significantly more effective than MTAD ( $P < 0.008$ ). In the second group, either MTAD, 2% CHX or 2.5% NaOCl in combination with laser treatment had a similar effect. Absence of growth was seen only for MTAD plus laser treatment. Complete elimination of *E. faecalis* was seen only for the combination of MTAD with diode laser irradiation. Combination therapy with MTAD irrigation and diode laser irradiation, within the parameters used in this study, can be recommended as an effective treatment option for complete elimination of *E. faecalis* from the root canal system.

**Moazami E, Mirhadi H, Geramizadeh B, Sahebi S. Comparison of soymilk, powdered milk, Hank's**

**balanced salt solution and tap water on periodontal ligament cell survival.** Dent Traumatol. 2011. doi: 10.1111/j.1600-9657.2011.01054.x.

The purpose of this study was to evaluate the ability of soymilk, powdered milk, and Hank's balanced salt solution (HBSS) to maintain human periodontal ligament (PDL) cell viability *in vitro*. PDL cells were obtained from extracted healthy third molars and cultured in Dulbecco's modified Eagles medium (DMEM). The cultures were exposed for 1, 2, 4, and 8 h to experimental solutions (tap water served as negative control and DMEM as positive control) at 37°C. The viable cells were then counted using the trypan blue exclusion technique. Data were analyzed by using one-way anova, post hoc Scheffe and two-way anova test. Statistical analysis showed that HBSS, powdered baby formula, and soymilk maintain cell viability equally well in different periods of times. Tap water cannot keep cells viable as well as other solutions. Soymilk and powdered baby formula can be recommended as suitable storage media for avulsed teeth for up to 8 h.

**Mohammadi Z. Endotoxin in endodontic infections: a review.** J Calif Dent Assoc. 2011;39(3):152-5, 158-61.

Gram-negative bacteria play an essential role in primary endodontic infections. They have several virulence factors such as endotoxin, a large molecule that plays a role in the initiation and perpetuation of apical periodontitis. This paper reviews the role of gram-negative bacteria in endodontic infections, structure and mechanisms of action of endotoxin, endotoxin in infected root canals, effects of calcium hydroxide and polymixin B on endotoxin, and applications of endotoxin to measure leakage.

**Mohammadi Z. Strategies to manage permanent non-vital teeth with open apices: a clinical update.** Int Dent J. 2011;61(1):25-30. doi: 10.1111/j.1875-595X.2011.00005.x.

If dental pulp injury occurs prior to complete root formation and apical closure, normal root development is halted. This condition produces several complications. Firstly, the apical diameter of the canal is often larger than the coronal diameter, so debridement is difficult. Secondly, the lack of an apical stop makes the obturation in all dimensions virtually impossible. And finally, the thin walls of the root canal are prone to fracture, so that surgical treatment is generally not a viable option. There are a number of protocols to manage non-vital open-apex teeth such as apexification, apical barrier technique (one-visit apexification), orthograde root filling using MTA, triple antibiotic paste, and tissue engineering concept. The aim of this paper is to review these treatment protocols.

**Mohammadi Z, Yazdizadeh M. Obturation of immature non-vital tooth using MTA. Case report.** N Y State Dent J. 2011;77(1):33-5.

The purpose of this report was to present the treatment of an immature necrotic permanent mandibular second

molar using mineral trioxide aggregate (MTA) as an orthograde root filling. In such cases, the canal remains large, with thin and fragile walls, and the apex architecture remains divergent. This case demonstrates the efficacy of MTA in this particular situation as an effective material to support regeneration of apical tissue in immature necrotic teeth. The treated tooth was asymptomatic. At the one-year follow-up, there were no clinical symptoms, but there was radiographic healing of periradicular tissues and new hard-tissue formation in the apical area of the affected tooth.

**Mohammadi Z, Palazzi F, Giardino L. Laser application in tooth bleaching: an update review.** Minerva Stomatol. 2011;60(4):167-78.

Since the development of laser, a variety of potential applications for lasers in endodontics such as pulp diagnosis, disinfection of the root canal system, canal shaping, obturation of the root canal, apicoectomy, treatment of dentin hypersensitivity, and tooth bleaching have been proposed. The aim of this paper was to review the benefits and drawbacks of laser tooth bleaching.

**Mohammadi Z, Dummer PM. Properties and applications of calcium hydroxide in endodontics and dental traumatology.** Int Endod J. 2011;44(8):697-730. doi: 10.1111/j.1365-2591.2011.01886.x.

Calcium hydroxide has been included within several materials and antimicrobial formulations that are used in a number of treatment modalities in endodontics. These include, inter-appointment intracanal medicaments, pulp-capping agents and root canal sealers. Calcium hydroxide formulations are also used during treatment of root perforations, root fractures and root resorption and have a role in dental traumatology, for example, following tooth avulsion and luxation injuries. The purpose of this paper is to review the properties and clinical applications of calcium hydroxide in endodontics and dental traumatology including its antibacterial activity, antifungal activity, effect on bacterial biofilms, the synergism between calcium hydroxide and other agents, its effects on the properties of dentine, the diffusion of hydroxyl ions through dentine and its toxicity. Pure calcium hydroxide paste has a high pH (approximately 12.5-12.8) and is classified chemically as a strong base. Its main actions are achieved through the ionic dissociation of Ca (2+) and OH (-) ions and their effect on vital tissues, the induction of hard-tissue deposition and the antibacterial properties. The lethal effects of calcium hydroxide on bacterial cells are probably due to protein denaturation and damage to DNA and cytoplasmic membranes. It has a wide range of antimicrobial activity against common endodontic pathogens but is less effective against *Enterococcus faecalis* and *Candida albicans*. Calcium hydroxide is also an effective anti-endotoxin agent. However, its effect on microbial biofilms is controversial.

**Nosrat A, Asgary S, Eghbal MJ, Ghodousi J, Bayat-Movahed S. Calcium-enriched mixture cement as**

**artificial apical barrier: A case series.** J Conserv Dent. 2011;14(4):427-31.

In comparison to the conventional apexification using calcium hydroxide, artificial apical barrier technique is more valuable and less time consuming. This article describes successful use of calcium-enriched mixture (CEM) cement as an artificial apical barrier in open apices. In this study, 13 single-rooted teeth with necrotic pulps and open apices were treated non-surgically. After copious irrigation of the root canals with NaOCl 5.25% and gentle filing, based on need for interappointment dressing, treatments were followed by CEM cement (BioniqueDent, Tehran, Iran) apical plug insertion in the first or second appointment. All cases were then permanently restored. All subjects were followed until radiographic evidence of periradicular healing was seen (mean 14.5 months). Clinically, all cases were functional and asymptomatic and complete osseous healing was observed in all the teeth. Considering the biological properties of CEM cement, this new endodontic biomaterial might be appropriate to be used as artificial apical barrier in the open apex teeth.

**Nosrat A, Seifi A, Asgary S. Regenerative endodontic treatment (revascularization) for necrotic immature permanent molars: a review and report of two cases with a new biomaterial.** J Endod. 2011;37(4):562-7.

Introduction: Revascularization is a valuable treatment in immature necrotic teeth that allows the continuation of root development. In this article we describe successful revascularization treatment of 2 necrotic immature first mandibular molars.

Methods: The clinical and radiographic examinations showed extensive coronal caries, immature roots, and periapical radiolucencies in mandibular first molars of a 9-year-old boy and an 8-year-old girl. The exam findings suggested revascularization treatment in both cases, which was started with irrigation of the canals by using NaOCl 5.25% for 20 minutes, followed by 3 weeks of triple antibiotic (metronidazole, ciprofloxacin, and minocycline) paste dressing. Next, the antibiotic paste was removed, bleeding was induced in the canals, and calcium enriched mixture (CEM) cement was placed over blood clots.

Results: In radiographic and clinical follow-ups both cases were asymptomatic and functional, periapical radiolucencies were healed, and roots continued to develop.

Conclusions: Revascularization is a realistic treatment in immature necrotic molars. In addition, placing CEM cement as a new endodontic biomaterial over the blood clot formed inside the canals provided good seal and favorable outcomes.

**Parirokh M, Asgary S, Eghbal MJ, Kakoei S, Samiee M. A comparative study of using a combination of calcium chloride and mineral trioxide aggregate as the pulp-capping agent on dogs' teeth.** J Endod. 2011;37(6):786-8.

Introduction: The addition of some chemicals to mineral trioxide aggregate (MTA) may improve the physical

properties of the biomaterial. The aim of this study was to compare a combination of MTA with/without CaCl (2) as pulp-capping agents in dogs' teeth.

Methods: The dental pulp of 32 teeth in four dogs were exposed and capped with either MTA or MTA/CaCl (2). After 2 months, the animals were sacrificed, and the teeth were prepared for histological evaluation. Pulpal response to the two capping materials was evaluated in terms of necrosis, inflammation, and formation of a calcified bridge. The chi-square test was used for data analysis.

Results: Histological results showed a higher percentage of inflammation and necrosis and a lower percentage of calcified bridge formation in MTA/CaCl (2) samples compared with MTA; however, the differences were not statistically significant ( $P>.05$ ).

Conclusions: The addition of CaCl (2) to MTA pulp-capping agent did not improve the properties of this biomaterial.

**Parirokh M, Mirsoltani B, Raouf M, Tabrizchi H, Haghdoost AA. Comparative study of subcutaneous tissue responses to a novel root-end filling material and white and grey mineral trioxide aggregate.** Int Endod J. 2011;44(4):283-9.

Aim: To compare the subcutaneous tissue response to grey mineral trioxide aggregate (GMTA), white mineral trioxide aggregate (WMTA) and a new experimental cement (calcium enriched cement, CEM).

Methodology: Thirty-six Wistar male albino rats each received three implants, containing one of the tested materials, and an empty tube as a control. Seven, 30 and 60 days after implantation, the animals were sacrificed. After histological preparation and H&E staining, the specimens were evaluated for capsule thickness, necrosis, and for the type, the severity, and the extent of inflammation. Kruskal Wallis and Chi-square tests were used for data analysis.

Results: After 1 week, CEM produced no necrosis compared to both types of WMTA and GMTA ( $P=0.007$ ). After 30 days, GMTA specimens had significantly less inflammation compared with WMTA and CEM ( $P=0.011$ ). After 60 days, less inflammation was associated with CEM specimens ( $P=0.0001$ ) compared to the other materials. Dystrophic calcifications in the connective tissue adjacent to all experimental material were detected.

Conclusion: Histological observation illustrated that all materials were well tolerated by the subcutaneous tissues.

**Hori A, Poureslami HR, Parirokh M, Mirzazadeh A, Abbott P. The ability of pulp sensibility tests to evaluate the pulp status in primary teeth.** Int J Paediatr Dent. 2011;21(6):441-5.

Background: Accurate determination of the pulp status is the most important part of conservative pulp therapy.

Aim: The aim of this study was to assess the ability of thermal and electrical pulp tests to assess the pulp status in primary teeth.

Design: Seventy-eight primary molar teeth in 36 children were investigated. Fifty-six teeth had unknown pulp status in need of endodontic treatment, and 22 were intact teeth with no signs of pulp disease. Cold, hot and electrical pulp testing (EPT) were performed on each tooth. The gold standard was established by direct inspection of the pulp after an access cavity had been made. The sensitivity, specificity, positive and negative predictive values for each test and different sequential combinations of pulp testing were calculated. Sequential combination test analysis was used for data analysis.

Results: The highest accuracy was found for EPT, followed by heat and cold tests. No significant difference was found between the accuracy of EPT and the heat test ( $P$ -values $>0.05$ ); however, the accuracy of EPT was significantly higher than that of the cold test ( $P$ -value $<0.05$ ).

Conclusion: Based on this study, EPT can be used as a reliable test for diagnosing the pulp status in primary teeth.

Eskandarizadeh A, Shahpasandzadeh MH, Shahpasandzadeh M, Torabi M, **Parirokh M.** **A comparative study on dental pulp response to calcium hydroxide, white and grey mineral trioxide aggregate as pulp capping agents.** J Conserv Dent. 2011 Oct;14(4):351-5.

Context: Vital pulp therapy has been known as one of the treatment options to preserve pulp after being exposed by trauma or caries.

Aim: To investigate human pulpal response to white and grey mineral trioxide aggregate (WMTA, GMTA) and Dycal (MTA) as pulp capping agents.

Setting and design: Human volunteers were participated in this randomized clinical trial.

Materials and methods: This study was conducted on 90 intact first and second premolars of human maxillary and mandibular teeth. The teeth were randomly assigned into three groups of 30 each. Under local anesthesia, teeth were exposed and capped either with GMTA, WMTA, or Dycal. After 30, 60, and 90 days 10 teeth of each group were extracted and prepared for histologic observation.

Statistical analysis: Histopathologic data were analyzed by  $\chi^2$ , Kruskal Wallis and Mann Whitney tests.

Results: the calcified bridge in teeth that were capped with GMTA was significantly thicker than Dycal at 30 and 60 days ( $P=0.015$  and  $P=0.002$ , respectively); whereas WMTA showed significantly thicker calcified bridge than Dycal at 90 days ( $P=0.02$ ). In addition, GMTA specimens showed significantly less inflammation compared to Dycal samples at 90 days interval ( $P=0.019$ ). No significant difference was found between GMTA and WMTA in terms of calcified bridge thickness and pulp inflammatory response to the capping materials ( $P>0.05$ ).

Conclusions: Based on the result of this study, both types of MTA can be suggested as the materials of choice for direct pulp capping procedure instead of Dycal as hard setting calcium hydroxide cement

**Raof M,** Zaherara F, **Shokouhinejad N,** Mohammadalizadeh S. **Elementary school staff knowledge and attitude with regard to first-aid management of dental trauma in Iran: a basic premise for developing future intervention.** Dent Traumatol. 2011 17.

Aim: The purpose of this study was to evaluate Iranian teachers' knowledge and attitude with regard to emergency management of dental trauma. Material and methods: A four-part questionnaire, including demographic data, knowledge, attitude, and self-assessment, was given to 422 teachers from 14 schools. Data obtained from 400 completed questionnaires were statistically analyzed using t-test, one-way anova and Pearson correlation coefficient.

Results: It was found that there was no statistically significant difference between knowledge and demographic variations ( $P>0.05$ ). However, there was a moderate positive association between knowledge and attitude toward emergency management of dental trauma ( $r=0.38$ ,  $P=0.0001$ ). The outcome indicated completely inadequate knowledge regarding the management of tooth fracture and avulsion. Most participants (94.3%) were unsatisfied with their awareness and suggested that further education on the topic should be offered.

Conclusions: The present study revealed considerably low knowledge of the participants regarding the first-aid management of dental trauma for the study group. As teachers get an opportunity to attend a case of dental trauma, strategies to improve the teachers' knowledge seem crucial.

Fayazi S, Ostad SN, **Razmi H.** **Effect of ProRoot MTA, Portland cement, and amalgam on the expression of fibronectin, collagen I, and TGF $\beta$  by human periodontal ligament fibroblasts *in vitro*.** Indian J Dent Res. 2011;22(2):190-4.

Context: Today many materials have been introduced for root-end filling materials. One of them is mineral trioxide aggregate (MTA) that is mentioned as a gold standard.

Aims: The purpose of this *in vitro* study was to evaluate the reaction of human periodontal ligament fibroblasts to the root-end filling materials, such as ProRoot MTA, Portland cement, and amalgam.

Settings and design: Eight impacted teeth were extracted in aseptic condition. The tissues around the roots were used to obtain fibroblast cells. After cell proliferation, they were cultured in the chamber slides and the extracts of the materials were added to the wells.

Materials and methods: Immunocytochemical method for measuring the expression of Fibronectin, collagen I and transforming growth factor beta (TGF $\beta$ ) was performed by Olysia Bioreport Imaging Software. Statistical Analysis Used: The results were analyzed by SPSS 13.0 and Tukey post hoc test with  $P<0.05$  as the limit of significance.

Results: Collagen expression in MTA specimens was higher than the other groups in 24 h significantly. After 48 h, the Portland cement group showed the most



expression of collagen significantly and after 1 week, Portland cement and MTA groups had the most expression of collagen but there was no significant difference between these 2 groups. After 1 week, the Portland cement group demonstrated a higher amount of TGF $\beta$  and fibronectin.

Conclusions: The results suggest that Portland cement can be used as a less expensive root filling material with low toxicity. It has better effects than amalgam on the fibroblasts.

**Saghiri MA, Lotfi M, Shokouhinejad N, Asgar K, Mehrvarzfar P. Influence of white mineral trioxide aggregate on inflammatory cells before and after expiry date.** Dent Traumatol. 2011 3.

Introduction: The aim of this study was to compare the effect of subcutaneously implanted white mineral trioxide aggregate (WMTA) on inflammatory reactions before and after expiry date.

Methods: Fifty Wistar rats were used in this study. Polyethylene tubes were filled with WMTA with expiry dates of 2008, 2009, and 2011, and empty ones serving as the controls were implanted into the subcutaneous tissue. The rats were sacrificed at 7-, 14-, 28-, and 60-day intervals. 5- $\mu$ m sections were stained with hematoxylin and eosin and observed under a light microscope. Inflammatory reactions were categorized as 0, none (without inflammatory cells); 1, mild (inflammatory cells < 25); 2, moderate (25-125 inflammatory cells); and 3, severe (more than 125 inflammatory cells). Statistical analysis was performed with Kruskal-Wallis test.

Results: All the experimental materials provoked moderate to severe inflammatory reactions after 7 days, which significantly differed from the control group ( $P < 0.05$ ). At 14-day interval, WMTA with expiry date of 2008 and the control group elicited mild to moderate infiltration of inflammatory cells. However, WMTA with expiry dates of 2009 and 2011 provoked moderate to severe inflammatory reactions, which were significantly different from WMTA with expiry date of 2008 and the control group ( $P < 0.05$ ). At 28- and 60-day intervals, the overall inflammation subsided in all the groups to mild to moderate infiltration of inflammatory cells without any significant differences ( $P < 0.05$ ).

Conclusion: It seems that the expiry date has less negative effects on the response of inflammatory cells. WMTA keeps its biocompatibility even after expiry date.

**Saghiri MA, Asgar K, Boukani KK, Lotfi M, Aghili H, Delvarani A, Karamifar K, Saghiri AM, Mehrvarzfar P, Garcia-Godoy F. A new approach for locating the minor apical foramen using an artificial neural network.** Int Endod J. 2011 Oct 19.

Aim: To develop a new approach for locating the minor apical foramen (AF) using feature-extracting procedures from radiographs and then processing data using an artificial neural network (ANN) as a decision-making system.

Methodology: Fifty straight single-rooted teeth were

selected and placed in a socket within the alveolar bone of a dried skull. Access cavities were prepared and a file was placed in the canals to determine the working length. A radiograph was taken to evaluate the location of the file in relation to the minor foramen and further checked after retrieving the tooth from the alveolar socket. The location of the file tip was categorized into: beyond the AF (long), within the root canal (short) and just at the minor AF (exact). Each radiograph was used to extract relevant features using K-means, Otsu method and Wavelet protocol. Thirty-six extracted features were used for training and the rest were used for evaluating the multi-layer Perceptron ANN model.

Results: Analysis of the images from radiographs (test samples) by ANN showed that in 93% of the samples, the location of the AF had been determined correctly by false rejection and acceptance error methods.

Conclusion: Artificial neural networks can act as a second opinion to locate the AF on radiographs to enhance the accuracy of working length determination by radiography. In addition, ANN can function as a decision-making system in various similar clinical situations.

**Reddy S, Neelakantan P, Saghiri MA, Lotfi M, Subbarao CV, Garcia-Godoy F, Gutmann JL. Removal of gutta-percha/zinc-oxide-eugenol sealer or gutta-percha/epoxy resin sealer from severely curved canals: an *in vitro* study.** Int J Dent. 2011;2011:541831.

The aim of this study was to compare the cleanliness of root canal walls after retreatment using two rotary retreatment files to hand instruments in severely curved canals obturated with gutta-percha and two different sealers. Single rooted mandibular premolars ( $n=90$ ) with root curvatures were instrumented and obturated with gutta-percha and an epoxy resin (Group 1,  $n=45$ ) or zinc oxide eugenol sealer (Group 2,  $n=45$ ). Following retreatment of the specimens ( $n=15$  ProTaper Universal Retreatment Files (Subgroup B) or R-Endo retreatment files (Subgroup C) after 1 month, split specimens were examined under a stereomicroscope and the percentage of remaining root filling material was statistically compared using one way ANOVA with Bonferroni adjustment for multiple comparisons ( $P=0.05$ ). The R-Endo system performed significantly better than the other two file systems ( $P < 0.05$ ). None of the systems used in this study cleaned root canals thoroughly. The R-Endo system did provide cleaner walls when compared to the other instruments used. The type of root filling materials had an impact on the outcomes with all techniques.

**Saghiri MA, Asgar K, Lotfi M, Nazari A, Karamifar K, Neelakantan P, L Gutmann J. Effect of storage temperature on sealing ability and solubility of White Mineral Trioxide Aggregate.** Acta Odontol Scand. 2011 Aug 5.

Abstract Objective: Knowledge about the effect of storage conditions on the clinical performance of Mineral Trioxide Aggregate (MTA) is of great importance for clinicians. The aim of this study was to

evaluate the effect of storage temperature on sealing ability and solubility of white MTA.

**Materials and methods:** This study was divided into two parts: sealing ability and solubility tests. Forty single-rooted human pre-molars were divided into three experimental (n=10) and two control groups (n=5). The root canals were instrumented and root apices were resected. Root-end cavities were prepared and filled with white MTA stored at 4°C, 25°C or 40°C. Microleakage was evaluated using a protein leakage test with bovine serum albumin at 24-h intervals for 120 days. The solubility test was also performed based on ISO specifications (ISO 2001-6876). Data were analyzed by one-way analysis of variance and post-hoc Tukey test, with a significance level set at p=0.05.

**Results:** The highest bovine serum albumin microleakage and the highest solubility rates were observed in 4°C followed by 25°C and 40°C groups. At higher temperatures, leakage needed significantly longer times to occur (p<0.05).

**Conclusions:** Based on these findings, storage temperature appears to play an important role in the properties and hence clinical outcomes of MTA.

**Saghiri MA, Asgar K, Lotfi M, Karamifar K, Neelakantan P, Ricci JL. Application of mercury intrusion porosimetry for studying the porosity of mineral trioxide aggregate at two different pH.** Acta Odontol Scand. 2011 Jul 5.

**Objective:** To evaluate a novel method of detecting and comparing the porosity of white Mineral Trioxide Aggregate and Portland cement at two different pH.

**Materials and methods:** Cylindrical specimens (n=120) were prepared from hydrated ordinary white Portland Cement (WPC) (n=60) and white Mineral Trioxide Aggregate (WMTA) (n=60) and exposed to environments with pH of 4.4 (n=30) or 7.4 (n=30). The pore size distribution and total pore volume were detected using Mercury Intrusion Porosimetry. Data were analyzed by analysis of variance and post-hoc Tukey or Tamhane test (p=0.05).

**Results:** The pore volume of WMTA was significantly lesser than WPC at both pH (p<0.05). The surface tension of mercury was taken as 480 (N/m) and the contact angle 141.3° for both materials. Pores were consistently found in all specimens. Total pore volumes for WPC and WMTA (cubic centimeter/gram) were 0.1954 and 0.1023, respectively, while the diameter of the pores ranged from 50-100 Å and 20-50 Å, respectively. **Conclusions:** Mercury Intrusion Porosimetry technique is a promising and reliable technique for assessing the porosity of endodontic materials.

**Shahravan A, Jalali SP, Torabi M, Haghdoost AA, Gorjestani H. A histological study of pulp reaction to various water/powder ratios of white mineral trioxide aggregate as pulp-capping material in human teeth: a double-blinded, randomized controlled trial.** Int Endod J. 2011;44(11):1029-33. doi: 10.1111/j.1365-

2591.2011.01916.x.

**Aim:** To compare the histological pulp reaction to various water/powder ratios of white mineral trioxide aggregate (MTA) as a pulp-capping material in healthy human teeth.

**Methodology:** Twenty-nine disease-free maxillary and mandibular third molar teeth, scheduled for extraction, were exposed mechanically and then capped with 0.28, 0.33 and 0.40 water/powder ratios of white MTA (ProRoot; Dentsply Maillefer, Ballaigues, Switzerland) and restored with glass ionomer. After 30 days, the teeth were extracted, resected apically and immersed in 10% formalin. For histological processing, the teeth were sectioned buccolingually in 5-µm-thick slices, stained with Haematoxylin and Eosin and evaluated by a light microscope. Samples were evaluated for intensity and type of inflammation, presence of necrosis, as well as continuity, morphology and thickness of calcified bridges. The data were analysed by Kruskal-Wallis and Mann-Whitney tests.

**Results:** There were no significant differences in the diameter, morphology and continuity of the calcified bridges, intensity and type of inflammation or presence of necrosis (P>0.05) in the pulps covered by MTA with various water/powder ratios. Two teeth failed to display a calcified bridge, and one had a pulp necrosis.

**Conclusion:** Water-to-powder ratios of MTA had no significant influence on the histological outcome of direct pulp capping on healthy pulps.

**Shokouhinejad N, Sabeti M, Gorjestani H, Saghiri MA, Lotfi M, Hoseini A. Penetration of Epiphany, Epiphany self-etch, and AH Plus into dentinal tubules: a scanning electron microscopy study.** J Endod. 2011;37(9):1316-9.

**introduction:** The purpose of this study was to measure the average depth of dentinal tubule sealer penetration in the middle third of teeth obturated with gutta-percha/AH Plus (Dentsply, DeTrey, Konstanz, Germany), Resilon/Epiphany (Pentron Clinical Technologies, Wallingford, CT), and Resilon/Epiphany self-etch (SE) using scanning electron microscopy (SEM).

**Methods:** The root canals of 36 extracted single-rooted human teeth were prepared and randomly divided into three groups. Obturations were performed with the following filling materials using the lateral compaction technique: group 1, gutta-percha/AH Plus; group 2, Resilon/Epiphany; and group 3, Resilon/Epiphany SE. The specimens were prepared for SEM examination. The average depth of sealer penetration into the dentinal tubules was measured. Data were analyzed by one-way analysis of variance and a post hoc Tukey test.

**Results:** The mean (± standard deviation) values for the average depth of sealer penetration in the middle third of the roots were 22.07 ± 6.92 µm, 31.56 ± 6.80 µm, and 21.50 ± 9.25 µm for AH Plus, Epiphany, and Epiphany SE, respectively. The average penetration depth of Epiphany was significantly higher than that of Epiphany SE and AH Plus (P<.05). There was no significant difference between the penetration depth of Epiphany SE

and AH Plus ( $P>.05$ ).

Conclusions: It could be concluded that the average penetration for Epiphany into dentinal tubules within the middle third of the roots was significantly deeper than that of Epiphany SE and AH Plus.

**Zarei M, Talati A, Mortazavi M, Zarch HH, Javidi M, Bidokhty HA. *In vitro* evaluation of the effect of canal curvature on adaptation of gutta-percha in canals obturated with HEROfill system by CBCT. J Oral Sci. 2011;53(1):43-50.**

A hermetic seal of the root canal space following canal preparation is important in endodontics. This study evaluated the effect of canal curve on adaptation of gutta-percha to dentinal walls of canals obturated using the Herofill system. For this *in vitro* study, 80 mesial roots of mature human first molars with length of 16 mm, curve between  $5^\circ$  and  $45^\circ$ , and no caries or resorption of the root surface were selected. A cone beam computed tomography system was used to evaluate the presence or absence of a gap in the samples. Photographs were taken in three sections: 2 mm above the curve, at the curve and 2 mm below the curve. The gap area was identified using Photoshop and AutoCAD software. Kruskal Wallis and Mann-Whitney tests were used to analyze the data mounted in a castcurve. There were significant differences between the two lateral condensation groups with various curves; roots with more curve had more gaps. When the Herofill and lateral condensation groups were compared without considering the sections and curve, there was a significant difference between these groups and the Herofill group had less gaps. The Herofill system is an alternative to the lateral condensation technique in severely curved canals.

**Zarrabi MH, Javidi M, Jafarian AH, Joushan B. Immunohistochemical expression of fibronectin and tenascin in human tooth pulp capped with mineral trioxide aggregate and a novel endodontic cement. J Endod. 2011;37(12):1613-8.**

Introduction: The purpose of the present study was the immunohistochemical study of fibronectin (FN) and tenascin (TN) in human tooth pulp capped with mineral trioxide aggregate (MTA) and novel endodontic cement (NEC) (calcium enriched mixture cement) after 2 and 8 weeks.

Methods: Thirty-two premolar teeth that were scheduled for extraction for orthodontic reasons were exposed and capped with either MTA or NEC. The teeth were randomly divided into 4 groups: group 1 (NEC for 2 weeks), group 2 (NEC for 8 weeks), group 3 (MTA for 2 weeks), and group 4 (MTA for 8 weeks). After capping the exposed pulps with either NEC (groups 1 and 2) or MTA (groups 3 and 4), half of the specimens underwent extraction and were prepared for histologic and immunohistochemical evaluation for FN and TN after 2 weeks, and the remaining half were assessed after 8 weeks. FN and TN expression was scored by a blinded pathologist on a scale of I-IV, and the results were analyzed by the Wilcoxon and Mann-Whitney U statistical tests.

Results: FN and TN staining was observed in all 4 experimental groups, and there was no significant difference between expression of FN and TN in any groups. FN and TN staining was observed in the dentinal bridge matrix after 2 weeks under MTA. Expression of both markers reduced significantly after 8 weeks under MTA, and staining was observed only in unmineralized parts of dentinal bridge. FN and TN expression was observed in the matrix of the dentinal bridge after 2 weeks under NEC, and staining of both markers was reduced after 8 weeks compared with 2 weeks. The staining pattern of TN in NEC groups was higher than in MTA groups in both time intervals. However, the difference was not significant.

Conclusions: The present study demonstrated that both MTA and NEC are suitable biomaterials for direct pulp capping and are able to stimulate dentinal bridge formation. Moreover, the role of FN and TN as 2 major components of the matrix of a reparative dentinal bridge was observed.