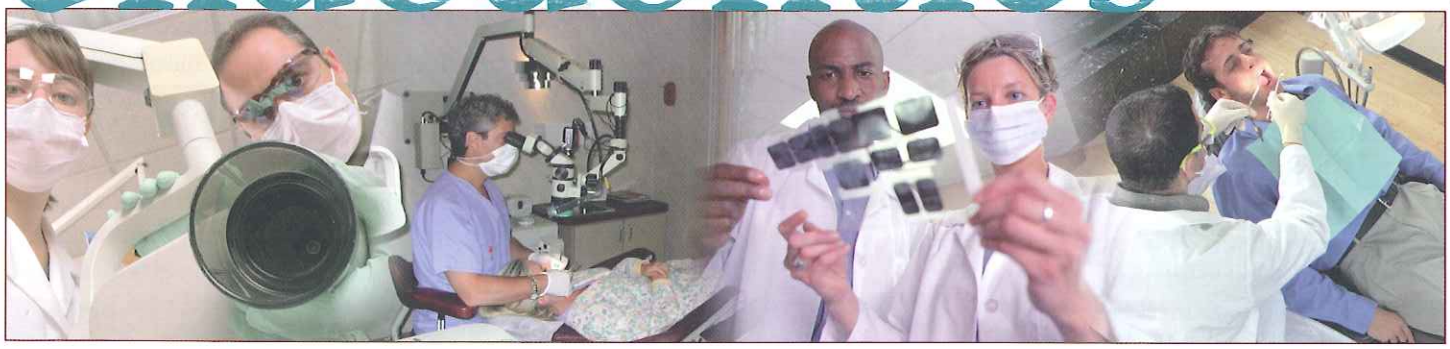
*A Professional Courtesy of:*

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

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

*Practice Limited to Endodontics*

update on endodontics™



# Hypertension, Apical Periodontitis And Endodontic Treatment

Hypertension (HTN), or high blood pressure (BP), is a chronic cardiac condition in which the systemic arterial BP is elevated. Most cases are termed primary hypertension, which refers to high BP for which no medical cause can be found, while about 5%–10% of cases (secondary HTN) are caused by other conditions that affect the kidneys, arteries, heart or endocrine system. The diagnosis of HTN is made when the average of ≥2 diastolic BP measurements on at least 2 subsequent visits is ≥90 mm Hg or when the average of multiple systolic BP readings on ≥2 subsequent visits is consistently ≥140 mm Hg.

**Inside this issue:** ***Summer 2011***



Persistent HTN is one of the risk factors for stroke, myocardial infarction, heart failure and arterial aneurysm, and is a leading cause of chronic kidney failure. Moderate elevation of arterial BP leads to shortened life expectancy. During the last 10 years, several studies carried out in patients with periodontal disease have related HTN and chronic periodontal infections localized to the marginal periodontium. These studies demonstrated a relationship between high BP and more severe periodontal parameters in such a way that hypertensive patients show a poorer periodontal state.

Apical periodontitis (AP) is an inflammatory lesion around the apex of a tooth caused by bacterial infection of the root canal system. Additionally, elevated systemic cytokines and inflammatory mediator levels have been observed in patients with AP, and several investigations suggest their association with type 2 diabetes and coronary heart disease. Segura-Egea et al from the University of Seville, Spain, investigated the prevalence of AP and endodontic treatment in hyperten-

sive patients and control patients without HTN.

In a cross-sectional study, the authors examined records of

- 40 hypertensive patients (23 men, 17 women)
- 51 control patients (20 men, 31 women)

The periapical status of all teeth was assessed using the periapical index score.

AP in ≥1 tooth was found in 75% of hypertensive patients and in 61% of control patients ($p = .15$; Table 1). One or more root-filled teeth (RFT) were found in 45% and 39% of hypertensive and control patients, respectively ($p = .58$). Among hypertensive patients, 5.2% of the teeth had AP, whereas in the control participants, 4.2% of teeth were affected ($p > .05$). The percentages of RFT in the study and control groups were 3.1% and 1.8%, respectively ($p > .05$). Among hypertensive patients, 65% of RFT had AP, whereas in the control patients, 43% of the RFT were associated with AP ($p > .05$).

### Conclusion

The authors concluded that prevalence of AP and endodontic treatment is not significantly different in hypertensive patients compared with control patients without HTN. However, a large prospective clinical and interventional study, controlling all possible confounding factors, will be needed to definitively assess the relationship between HTN and endodontic variables.

*Segura-Egea JJ, Jimenez-Moreno E, Calvo-Monroy C, et al. Hypertension and dental periapical condition.* J Endod *2010;36: 1800-1804.*

## Root Anatomy of The Permanent Mandibular First Molar

The prevention and/or healing of periapical disease is the main goal of endodontic therapy. Clinically, this requires cleaning, shaping and disinfection, followed by complete obturation of the root canal system. However, the root canal anatomy might present a clinical challenge directly related to the treatment outcome. de Pablo et al from Universidad Europea de Madrid, Spain, reviewed the literature related to root anatomy and root canal configuration of the permanent mandibular first molar.

Using key words, the MEDLINE search identified published literature from 1966 through 2010 related to the root anatomy and root canal morphology of the permanent mandibular first molar. Forty-one studies, including a total of 18,781 teeth, were identified. Data evaluated and summarized included methodology, population, number of teeth per study, number of root canals, type of root canal configuration and identification of the number of apical foramina.

The vast majority of mandibular first molars had 2 roots. Incidence of a third root (13%) was strongly correlated with the ethnicity of the study population. The authors stated that in the Mongol, Native American, East Asian and Eskimo populations, the presence of a third root is a normal anatomical variation.

Analysis of the canals found the following:

- Three canals were identified in 61.3% of the mandibular first molars, 4 canals in 35.7% and 5 canals in approximately 1%.
- Root canal configuration of the mesial root revealed 2 canals in 94.4% and 3 canals in 2.3%.
- The most common canal system configuration was 2 separate canals (52.3%), followed by 2 canals that join into 1 canal (35%).
- Root canal configuration of the distal root revealed a single-canal configuration in 62.7%, followed by 2 canals that merge (14.5%) and 2 separate canals (12.4%).
- The presence of isthmus communications between the root canals averaged 54.8% on the mesial and 20.2% on the distal root.

**Table 1.** *Prevalence of AP, RFT and RFT with AP in hypertensive (n = 40) and control (n = 51) participants*

| | AP *n* (%) | RFT *n* (%) | RFT-AP *n* (%) |
|---|---|---|---|
| Hypertensive | 30 (75) | 18 (45) | 13 (72) |
| Control | 31 (61) | 20 (39) | 9 (45) |
| **Total** | **61 (67)** | **38 (42)** | **22 (58)** |
| Odds ratio, hypertensive | 1.9* | 1.3* | 3.2* |

*p > .05.

### Conclusion

The number of roots on the mandibular first molar is directly related to ethnicity. Root canal morphology and configuration might present the clinician with a complex anatomy requiring more diagnostic approaches, access modifications and clinical skills to successfully localize, negotiate, disinfect and seal the root canal system.

*de Pablo ÓV, Estevez R, Péix Sanchez M, et al. Root anatomy and canal configuration of the permanent mandibular first molar: a systematic review.* J Endod *2010; 36:1919-1931.*

## Causes and Complications of Injured Teeth

Dental practitioners quite often confront traumatic dental injuries resulting from falls, sports and traffic accidents. The reported incidence of these injuries during 1 year ranges between 1.5% and 2.8%. These injuries occur more frequently in children between 8 and 15 years of age.

The majority of dental injuries involve anterior teeth, as well as hard dental tissues, gingiva, periodontal tissues, dental pulp and alveolar bone. Healing depends on such factors as the level of root development, the extent of damage to periodontal tissues and the effect of bacterial contamination from the oral cavity. Because complications may occur weeks, months or even years after the injury, dental injuries need long-term follow-up.

**Table 2.** *Frequency of dental injuries, stratified for trauma type*

| Diagnosis of injuries | Number of teeth |
|---|---|
| Enamel fractures | 58 |
| Enamel-dentin fractures | 233 |
| Crown fractures with exposed pulp | 76 |
| Crown-root fractures | 5 |
| Root fractures | 49 |
| Crown fractures and luxation | 21 |
| Concussion | 14 |
| Subluxation | 58 |
| Extrusive luxation | 89 |
| Lateral luxation | 207 |
| Intrusive luxation | 21 |
| Avulsion | 58 |

To examine the frequency of different types of dental injuries, the age of patients at the time of dental injury, the main etiological factors of dental injuries in each age group and the occurrence of posttraumatic complications, Hecova et al from Charles University in Prague, Czech Republic, conducted a retrospective study. Children and adult patients were included, but patients with repeated dental trauma were excluded.

A total of 423 patients were treated for dental trauma at the Faculty Hospital in Pilsen from 1997 to 2002. The patients were invited to return for follow-up a minimum of 5 years after the first treatment of their dental injury; 384 of 423 patients (90.8%) responded.

During the examination of the injured teeth, the authors assessed the color of the clinical crown, the mobility of the crown, the reaction to percussion of the tooth, thermal cold tests made with tetrafluoroethane (–50° C) and periapical bisecting angle radiographic exposures.

A diagnosis of pulp necrosis was established if 3 criteria were met:

1. grey crown discoloration
2. loss of pulpal sensitivity to cold
3. radiographic periapical radiolucencies

The frequency of dental injuries is shown in Table 2. Posttraumatic complications included

**Pulp necrosis**—In all types of dental trauma, pulp necrosis was the most frequent posttraumatic complication. Of the 889 examined teeth, 239 teeth exhibited pulp necrosis (26.9%). In case of luxations, pulp necrosis was most frequently observed in teeth with intrusive luxation (76.2%), more specifically, in 6 of 9 (66.7%) intruded immature teeth and 10 of 12 (83.3%) intruded mature teeth. In laterally luxated teeth, necrosis occurred in 89 of 141 teeth with closed apices (63.1%) and in 9 of 66 teeth with open apices (13.6%), a statistically significant difference ($p < .0001$). After replantation of avulsed teeth, pulp necrosis occurred in all 32 teeth with closed root apices (100%) and in 13 of 17 teeth with open apices (76.5%; $p = .0112$).

**Pulp canal obliteration**—Evaluation of x-ray images revealed canal obliteration in 80 teeth (9.0%).

**Root resorption**—Radiographic examination revealed the occurrence of external resorption of the root in 144 teeth (16.2%).

**Loss of the injured teeth**—Thirty-nine teeth were extracted within the observation period of 5 years.

### Conclusion

The rate of pulp necrosis is high following traumatic tooth injuries. Additionally, teeth with dislocation injuries sustain a considerable risk of periodontal healing complications. Thus, regular recall examinations are necessary to detect complications early. Avulsion has by far the lowest healing rate and highest rate of tooth loss. Expedited tooth replantation, appropriate transport medium and early extirpation of necrotic pulps are of high importance for favorable healing.

*Hecova H, Tzigkounakis V, Merglova V, Netolicky J. A retrospective study of 889 injured permanent teeth.* Dent Traumatol *2010;26:466-475.*

## Histological Evaluation of Furcation Perforations

Caused by caries, resorption or iatrogenic factors, perforations are mechanical or pathological communications between the root canal system and the outer tooth surface. The prognosis of the tooth depends on the location and size of the perforation, the presence of bacterial contamination and the timing of the sealing of these perforations. Previous studies have reported that the outcome of treated perforations depends in part on the sealing material, which should have good physicochemical properties and be biocompatible.

da Silva et al from Universidade Estadual Paulista, Brazil, evaluated the biological response of the periodontium adjacent to furcation perforations in rat molars filled with 1 of the following:

- Endo-CPM-Sealer (CPM; EGEO S.R.L., Buenos Aires, Argentina)
- white mineral trioxide aggregate (MTA; Angelus, Londrina, Brazil)
- zinc oxide–eugenol cement (ZOE; S.S. White, Rio de Janeiro, Brazil)

The pulp chamber floors of maxillary right first molar teeth were perforated and sealed with either CPM, MTA or ZOE. The control group consisted of the untreated left first molars. After 7, 15, 30 and 60 days, the rats were sacrificed, and fragments of the maxilla were removed and immersed in fixative solution. The jaws were fixed, decalcified and embedded in paraffin. Sections were stained with hematoxylin and eosin, and Masson's trichrome, and were prepared to measure markers of osteoclastic cells. The authors measured the

- width of the periodontal space
- numerical density of inflammatory cells
- number of osteoclasts on the bone surface

Statistical analyses were performed using analysis of variance and Tukey test ($p \leq .05$).

In all experimental groups, the greatest number of inflammatory cells was observed at 7 days, with the largest number in the ZOE group. In this group, the intense inflammatory process was related to a significant increase ($p \leq .05$) in the number of osteoclasts and, thereby, in an increase in the width of the periodontal space. At 60 days, no significant differences in osteoclast numbers among CPM, MTA and control groups occurred; the periodontal space was also significantly reduced in the experimental groups compared with the initial periods. However, in the ZOE group, the periodontal space was significantly larger ($p \leq .05$) compared with MTA-based materials.

### Conclusion

A significant reduction in the number of osteoclasts and in the periodontal space of MTA and CPM groups occurred, indicating that these materials may induce bone repair in perforation sites. These findings suggest that MTA-based materials are more biocompatible than ZOE.

*da Silva GF, Guerreiro-Tanomaru JM, Sasso-Cerri E, et al. Histological and histomorphometrical evaluation of furcation perforations filled with MTA, CPM and ZOE.* Int Endod J *2011;44:100-110.*

### In the next issue:

- Effect of dental injuries to primary teeth on permanent teeth
- Intranasal analgesic for endodontic pain
- Evaluation of irrigant delivery techniques

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