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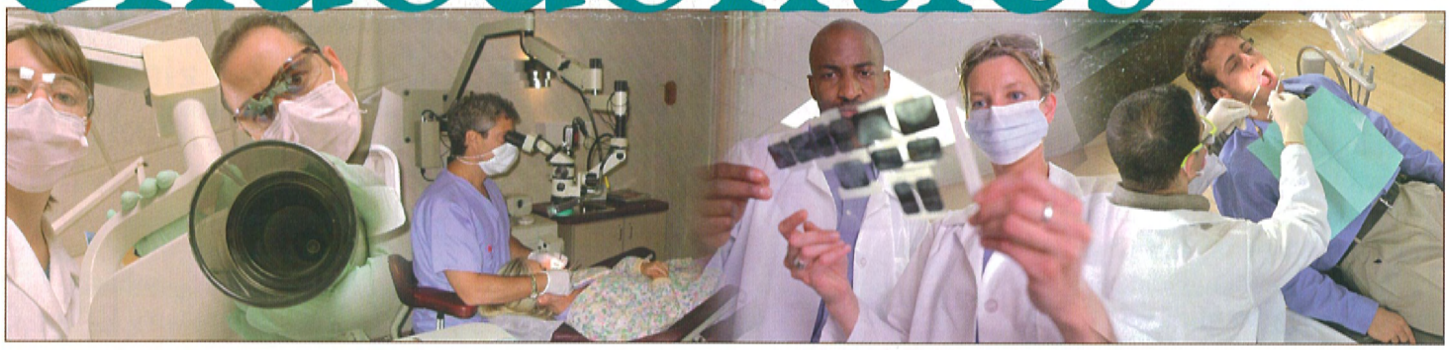

Apical Periodontitis and Root-filled Teeth

A similarity exists between the physiopathology of apical periodontitis and marginal periodontitis. A mixture of microorganisms, mostly anaerobic, has been established as the main cause of both endodontic and periodontal disease. The similarity of the endodontic and periodontal microflora suggests that cross-infection between the root canal and the periodontal pocket can occur.

A number of pathways connecting endodontic and periodontal tissues have been described. The most common anatomic pathways are the apical foramen, accessory canals and dentinal tubules. Clinical studies have shown that an endodontic infection can influence the periodontal condition. In these studies, treatment of the apical periodontitis in order to promote healing after periodontal therapy was advised.

The relation between endodontic treatment failures and the periodontal condition has not yet been investigated thoroughly. Ørstavik et al (2004) found the reduction of marginal bone support to be a significant negative factor for the prognosis of root-canal treatment. Apparently, data on the effect of the periodontal condition on the presence of apical periodontitis in root-filled teeth are scarce. The purpose of this study by Stassen et al from Ghent University, Belgium, was to investigate (1) the relation of periodontal pocket depths on the periapical condition of root-filled teeth and (2) a number of parameters related to endodontic and restorative treatment on the prevalence of apical periodontitis in patients with moderate-to-severe periodontal treatment need.

Coronal restoration and periapical condition: The type of coronal restoration had no influence on the prevalence of apical periodontitis, nor did the presence of a post. However, radiographic signs of apical periodontitis were detected in significantly more teeth with unaccept-

Inside this issue: ***Winter 2007***

able coronal restorations than in teeth with acceptable coronal restorations.

Root filling and periapical condition: The length of the root filling had a statistically significant effect on the prevalence of apical periodontitis. Root fillings ending beyond the radiographic apex showed signs of apical periodontitis in 71% of cases, and root canals filled >2 mm short showed apical periodontitis in 57% of cases. Poorly condensed root fillings showed statistically more signs of apical periodontitis than homogeneous root fillings. When the overall quality of the root filling was evaluated, there were significantly fewer signs of apical periodontitis with acceptable root fillings compared with unacceptable root fillings.

The coronal level of the root filling in relation to the marginal bone level proved to be a significant factor. Apical periodontitis was more prevalent when the coronal extent of the root filling ended coronal to the lowest marginal bone level compared with root fillings with a coronal level below the marginal bone level.

Periodontal treatment: In this study, it was found that the prevalence of apical periodontitis was significantly lower on teeth that had received periodontal treatment (scaling and root planing). A possible explanation could be that the concentration of pathogens in the periodontal pocket was reduced.

Conclusion

A high prevalence of radiographic signs of apical periodontitis was found in association with root-filled teeth in the present group of patients with radiographic signs of bone loss. The coronal level of the root filling in periodontally compromised teeth significantly influenced the prevalence of apical periodontitis. This implies that reduction of the coronal level of the root filling below or at least to the level of the marginal bone is advisable. A hermetic seal of the remaining root-canal space with restorative materials is necessary to obtain a better seal than can be achieved with current root-filling materials.

Stassen IGK, Hommez GMG, De Bruyn H, De Moor RJG. The relation between apical periodontitis and root-filled teeth in patients with periodontal treatment need. Int Endod J *2006;39:299-308.*

Root-canal Irrigants and Apical Biofilms

A biofilm has recently been defined as a microbial community characterized by cells that are attached to a substratum, that are in a matrix of extracellular polymeric substance (EPS), and that exhibit altered growth phenotypes. Biofilms offer their member cells several benefits, the foremost being protection from killing by antimicrobial agents.

Few studies have evaluated the efficacy of endodontic irrigants against microorganisms grown as a biofilm. Therefore, the purpose of this study by Dunavant et al from Texas A&M University System Health Sciences Center, Dallas, was to introduce a new in vitro method for evaluating the efficacy of endodontic irrigants on biofilms and to quantify and compare the efficacy of contemporary irrigants currently used in root-canal treatment against *Enterococcus faecalis* biofilms.

Based on the results of this study, sodium hypochlorite (NaOCl; Lasso Bleach, Labbco Inc., Houston, Texas) was highly effective in eliminating *E. faecalis* grown in biofilm. In addition, SmearClear (SybronEndo, Orange, Calif.) eliminated *E. faecalis* biofilm more effectively than 2% chlorhexidine gluconate (CHX; Vista Dental Products, Racine, Wis.), REDTA (Roths International Ltd, Chicago, Ill.) and BioPure MTAD (Dentsply Tulsa Dental, Tulsa, Okla.), and may prove to be a useful adjunct to the root-canal irrigation regimen (Table 1). BioPure MTAD was the least effective solution tested against *E. faecalis* biofilm. The biofilm model used in this study was effective in determining the in vitro antimicrobial efficacy of root-canal irrigants.

Table 1. *Percentage kill of* E. faecalis *by different test agents*

Test agent	N	Mean ± SD
1% NaOCl	32	99.78 ± 0.356[a]
6% NaOCl	96	99.99 ± 0.000[a]
SmearClear	32	78.06 ± 33.257[b]
2% CHX	32	60.49 ± 44.596[c]
REDTA	32	26.99 ± 29.997[d]
BioPure MTAD	32	16.08 ± 21.191[e]

Unit: percent. Letters a–e in column 3 indicate statistically significant homogeneous groups (p < .05).

Conclusion

Because biofilms form on root surfaces in vivo, it would appear that a biofilm model is more clinically relevant for the evaluation of antimicrobial efficacy.

Dunavant TR, Regan JD, Glickman GN, et al. Comparative evaluation of endodontic irrigants against Enterococcus faecalis *biofilms.* J Endod *2006;32:527-531.*

Analysis of Cracked Teeth

It is well known that cracked teeth occur most frequently in molar teeth with large or defective restorations, especially in patients aged >50 years. However, with increasing knowledge and expertise in diagnosing cracks in teeth, they are being found frequently in intact teeth without restorations.

The aim of this study by Roh and Lee from Yonsei University, South Korea, was to analyze the frequency of cracked teeth in a dental hospital setting during a 1-year period, and to find out the characteristic features of such teeth. For the 1-year period, each tooth that was identified as being cracked was recorded and analyzed in terms of the classification of cavity type and restorative material, the nature of the opposing tooth, the location in the arch, the age and gender of the patient, any presenting clinical signs or symptoms and the treatment result.

Cracks were observed most frequently in teeth without restorations (60.4%) and then in those with class I restorations (29.2%). The highest prevalence was in those patients >40 years

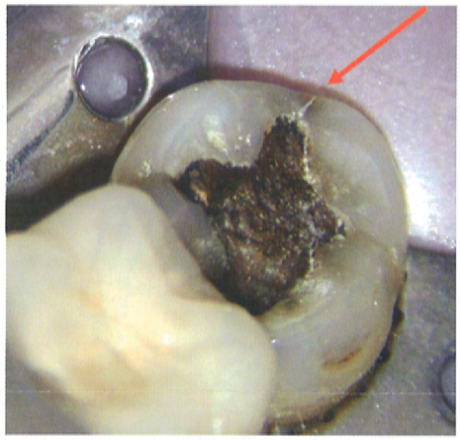

Figure 1. Mandibular molar tooth with a fracture along the distal marginal ridge.

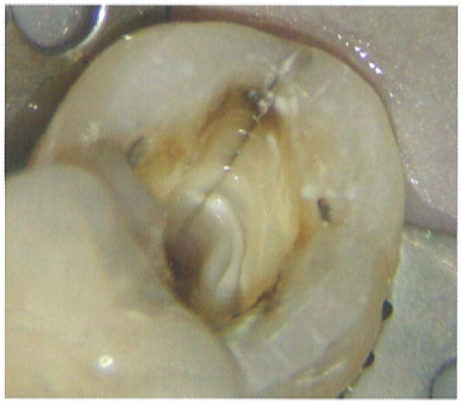

Figure 2. The same tooth after endodontic access, illustrating that the crack extends deep into the distal canal.

old (31.2% in their 40s and 26.6% in their 50s); the prevalence was similar in men and women. Cracked teeth were found more frequently in maxillary molars (33.8% in the first molar; 23.4% in the second molar) than in mandibular molars (20.1% in the first molar; 16.2% in the second molar). A total of 96.1% of the cracked teeth responded to the bite test, and 81.1% of the teeth had cracks in the mesiodistal direction.

Conclusion

The prevalence of cracked teeth was highest in the intact teeth with no restoration, in maxillary molars and in those patients >40 years of age. When an intact maxillary posterior tooth that is sensitive to biting and temperature is being examined, a tooth crack or fracture that extends in the mesiodistal direction needs to be considered in the diagnosis.

Roh B-D, Lee Y-E. Analysis of 154 cases of teeth with cracks. Dent Traumatol *2006; 22:118-123.*

Orifice Plugs and Periapical Inflammation

The goal of endodontic treatment is to prevent or cure apical periodontitis, which is caused primarily by microorganisms within the root-canal system. Reinfection of the root-canal system and periapical (PA) inflammation can occur when there is coronal leakage, even after thorough root-canal filling.

Gutta-percha combined with sealer (GP/S), the most widely used root-filling material, has been demonstrated to be a poor sealing material when challenged. Swanson and Madison (1987) reported that when the root canals filled with GP/S are exposed to artificial saliva, leakage occurs in the canal space within 3 days. Torabinejad et al (1990) reported that >50% of the root canals filled with GP/S were contaminated after 19 days of exposure to *Staphylococcus epidermidis*, and 50% were contaminated after 42 days of exposure to *Proteus vulgaris*. Several in vivo animal studies have also demonstrated that, when inoculated with plaque, 40–80% of premolar root

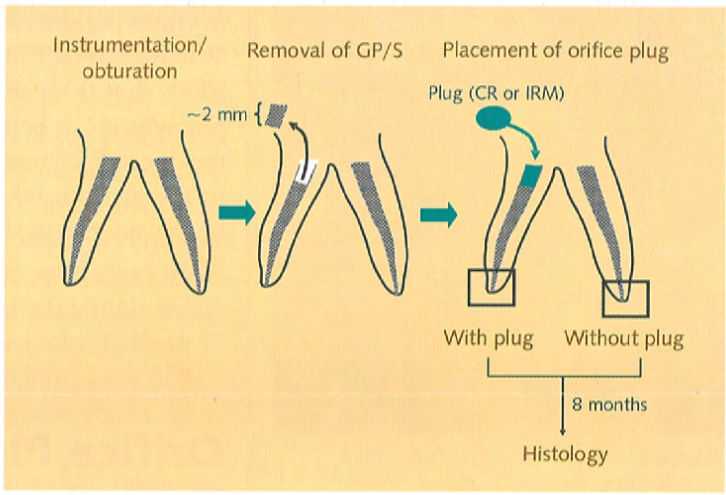

Figure 3. Illustration of the experimental procedures. After instrumentation and obturation were completed, for the group with plugs, 2 mm of the coronal part of filled materials were removed and replaced with CR or IRM.

canals filled with GP/S developed mild inflammation.

In an attempt to minimize the coronal leakage of GP/S root fillings, Barthel et al (2001) placed coronal barriers of composite resin (CR) or intermediate restorative material (IRM) in vitro and examined its effects. The results showed that CR had better sealing against bacteria than did IRM.

A study by Yamauchi et al from the University of North Carolina at Chapel Hill, along with many other in vitro and in vivo studies, demonstrated that GP/S alone leaks and that placement of orifice barriers may be beneficial to prevent that leakage. The authors evaluated the effect of orifice plugs using dentin-bonding/CR or IRM on coronal leakage in vivo.

Sixty-one premolar roots in 3 beagle dogs were instrumented and filled with GP and AH26 sealer (GP/S) or GP alone. The coronal 2 mm was replaced with CR or IRM or left untreated. The access cavities were kept open for 8 months, the dogs were euthanized and the periapical regions of the roots were histologically examined. The experimental design can be seen in Figure 3.

The results are shown in Table 2. The group without plugs (GP/S) had an inflammation rate of 89%. Of those, severe inflammation was found in >55% of the roots. In the groups with plugs, the inflammation rate was reduced to 38% (GP/S + IRM), 39% (GP/S + CR) and 58% (GP + CR). Of those, severe inflammation was observed in 0%, 14% and 30% of the roots, respectively.

Table 2. *PA inflammation with and without plugs*

	Materials used		PA inflammation	
	Root filling	Plug	Rate (%)	Severity
Without plug	GP/S		16/18 (89%)	M = 7; S = 9
With plug	GP/S	IRM	5/13 (38%)	M = 5; S = 0
	GP/S	CR	7/18 (39%)	M = 6; S = 1
	GP	CR	7/12 (58%)	M = 5; S = 2

M, mild; S, severe.

The differences in the inflammation rate between the groups without plugs (89%) and those with IRM (38%) or composite orifice plugs (39%) were statistically significant ($p = .001$ and $p = .004$, respectively).

Conclusion

The substantial reduction in apical periodontitis by the use of a coronal plug underscores the clinical importance of providing an additional barrier against coronal leakage in comparison to that provided by GP/S alone.

Yamauchi S, Shipper G, Buttke T, et al. Effect of orifice plugs on periapical inflammation in dogs. J Endod *2006;32:524-526.*

In the next issue:

- Safety of electronic apex locators in patients with cardiac pacemakers
- Outcome of endodontic treatment vs single-tooth implants
- Root-canal morphology of the human maxillary first molar
- The antimicrobial efficacy of MTAD vs EDTA against *E. faecalis*

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