

A Professional Courtesy of:



DR. SIMONA PESUN • DR. RODRIGO SANCHES CUNHA  
DR. MICHAEL RODILLO • DR. ALDO DEL CARPIO PEROCHENA

271 Madison St. • Winnipeg, Manitoba R3J 1H6  
Ph: 204.808.0030 • Fax: 204.808.0031  
Email: welcome@prairieendo.ca • www.prairieendo.ca



## Impact of Endodontic Treatment Quality

The complex anatomy of molars makes them particularly challenging for achieving successful endodontic treatment. Cone beam computed tomography (CBCT) enables accurate assessment of periradicular tissues, leading to improved long-term prognosis.

The Periapical and Endodontic Status Scale (PESS) takes advantage of the 3-dimensional imaging capabilities of CBCT. The PESS integrates the assessment of prognostic factors (lesion size, relationship between root and radiolucent lesion, location of bone destruction) found in the Complex Periapical Index with the Endodontically Treated Teeth Index (ETTI), factors that help evaluate the quality of endodontic treatment, such as root canal filling length, homogeneity of the filling, coronal seal and complications. While the impact on oral health of the development and severity of lesions following primary root canal treatment is well-known, no comprehensive study has been undertaken to evaluate how treatment quality affects the development and severity of apical radiolucency in maxillary and mandibular molars.

Şahin from Van Yüzüncü Yıl University and Gündüz from Bilecik Şeyh Edebali University, Türkiye, conducted a retrospective analysis using CBCT scans of 396 maxillary and mandibular first and second molars that had undergone root canal treatments  $\geq 4$  years prior. Preoperative CBCT scans confirmed the absence of periapical lesions in all included teeth at the time of root canal treatment. Root canal treatment quality was evaluated using PESS; teeth scoring above zero for lesion size, bone destruction location, or relationship between the root and radiolucent lesion were classified as positive for apical radiolucency.

### Inside this issue:

- Pulpal Deterioration After Dental Restoration
- Tooth Survival and Periapical Healing by Coronal Restoration Type
- Posttreatment Apical Periodontitis and Systemic Inflammation

Four factors were significantly associated with apical radiolucency:

- short root canal filling length ( $>2$  mm from apex)
- inadequate filling homogeneity (incomplete obturation)
- insufficient coronal restoration
- presence of endodontic complications

Mandibular first molars showed a significantly higher prevalence of apical radiolucency than did mandibular second

molars, which were more commonly associated with healthy periapical structures. Maxillary molars exhibited more frequent fractured instruments, cortical bone destruction and short root canal fillings than did mandibular molars, which were more likely to have fillings confined to the pulp chamber. ETTI scores correlated significantly with lesion size, bone destruction location and root-radiolucency relationship; teeth with the best ETTI scores, indicating the highest quality of endodontic treatment, had the highest rate of healthy periapical outcomes (73%).

### Conclusion

This study demonstrated that short root canal fillings, inadequate filling homogeneity, insufficient coronal restorations, perforations and missed canals were all associated with a significant increase in apical radiolucency; inadequate filling homogeneity and insufficient coronal restorations were also linked to cortical bone destruction and furcation involvement. These outcomes can compromise the success of both surgical and nonsurgical endodontic retreatment.

*Şahin P, Gündüz H. Impact of endodontic treatment quality on the severity of apical periodontitis in molars [sic] teeth: a retrospective CBCT study. Oral Radiol 2025;doi:10.1007/s11282-025-00844-z.*

## Pulpal Deterioration After Dental Restoration

**M**any factors influence the success of restorative dental procedures, any of which may contribute to the risk of a restoration failure requiring endodontic interven-

**Table 1. Median time from final restoration to subsequent endodontic treatment in 1360 cases.**

Variable	n	Median time (months)
<b>Sex</b>		
Men	677	15.0
Women	683	13.7
<b>Age at final restoration</b>		
19–35 years	120	9.9
36–55 years	452	17.4
≥56 years	775	13.8
<b>Tooth type</b>		
Incisor/canine	360	12.0
Premolar	451	14.1
Molar	549	16.2
<b>Restoration material/type</b>		
Composite resin	714	11.9
Amalgam	382	17.4
Glass ionomer	88	11.4
Crowns/bridge retainers	176	28.0
<b>Number of surfaces at final restoration</b>		
≤2	850	13.9
>2	334	11.5

tion. But no studies have definitively established the risk period for pulpal deterioration following restorative dental treatment. To address this question and to establish which of the potential factors are associated with the timing of pulpal deterioration, Desai et al from the University of Toronto, Ontario, conducted a retrospective case-control study using dental records from a major university's undergraduate and graduate dental clinics over a period of 25 years. Records of patients who underwent a definitive restorative procedure on ≥1 permanent teeth at the clinic and subsequently underwent a nonsurgical endodontic treatment (i.e., pulpotomy, pulpectomy, nonsurgical root canal therapy) were included in the study. From the records, the researchers extracted demographic information (age, sex), restorative his-

tory (date of completion, restorative material, number of procedures), concurrent dental procedures, and the time between the final restoration and the initiation of endodontic therapy. A control group of patients, followed for ≥2 years after restorative procedure and matched for age and tooth type but without subsequent endodontic treatment, was randomly generated from all patients who met these criteria.

For the 1360 teeth included in the cases, the median time from final restoration to endodontic treatment was 14.3 months, longer for men, middle-aged adults, molars, crowns and bridge retainers, and amalgam restorations. Women, young adults, incisors and canines, composite resin restorations, glass ionomer restorations, restorations involving >2 surfaces

and teeth with pulpal exposure at the time of the final restoration underwent endodontic treatment sooner than the median time. Anterior teeth needed endodontic treatment earlier than did posterior teeth (Table 1).

A Cox proportional hazard regression analysis showed that restoration material and type, number of restored surfaces and pin retention were associated with time to endodontic treatment. Teeth that received crowns or bridge retainers had a median time to pulpal deterioration of 28.0 months, while teeth with amalgam restorations had a median time of 17.4 months. These numbers compared favorably with teeth that had composite resin restorations (11.9 months) or glass ionomer restorations (11.4 months). In the final multivariate analysis, 2 factors were significantly associated with pulpal deterioration:

- the use of glass ionomer vs amalgam (hazard ratio: 1.6)
- restorations involving >2 surfaces vs those with ≤2 surfaces (hazard ratio: 1.5)

### Conclusion

Although this study did not establish a direct causal relationship between restorative procedures and pulpal deterioration, the correlations found in this large sample may provide some guidance for treatment planning of restorative dentistry. Preventive care, including regular recall visits, remains the most powerful tool for maintaining pulpal health.

Desai S, Tepperman A, Ben Suleiman A, et al. Pulpal deterioration following restorative procedures: a case-control study. *J Endod* 2025;51:1177-1186.

## Tooth Survival And Periapical Healing by Coronal Restoration Type

A proven method to preserve teeth after irreversible pulpal or periapical disease and improve a patient's quality of life, root canal treatment weakens the tooth, resulting in poorer survival rates than those for untreated teeth. The most frequent causes of posttreatment failure are the quality of the root filling and the adequacy of the coronal seal. Strategies for restoring root-filled teeth fall into 2 categories:

- indirect permanent restorations (full- or partial-coverage fixed dental prostheses)
- direct permanent restorations (resin-composite or dental amalgam fillings)

Because studies comparing the 2 strategies have yielded inconsistent results, Kaaber et al from Aarhus University, Denmark, conducted a systematic review and meta-analysis of available clinical evidence comparing the survival rates and periapical healing outcomes of root-filled teeth restored with direct or indirect coronal restorations. They searched 3 major databases for randomized clinical trials and nonrandomized cohort studies with a mean follow-up of ≥2 years that provided comparative data on tooth survival and/or periapical healing in root-filled teeth restored with indirect and direct coronal restorations. After eliminating reports not meeting the inclusion criteria, 10 nonrandomized longitudinal clinical studies and 1 randomized controlled clinical trial remained. In 7 of the 11 studies, the

outcome reported was tooth survival; in 1, periapical healing; and in 3, both tooth survival and periapical healing. The type of tooth treated, endodontic treatment factors and restorative treatment factors varied significantly among the studies.

They found a statistically significant positive impact on tooth survival rate with indirect restorations rather than direct restorations (odds ratio [OR] 0.44; 95% confidence interval [CI], 0.25-0.79). No statistically significant difference was found between restoration types in periapical healing (OR 0.86; 95% CI, 0.36-2.01).

The results of this systematic review and meta-analysis must be treated with caution. Studies included different types of teeth and different restorative factors; they ranged in size from 18 to 248,299 teeth; and as for periapical healing rates, 3 of the 4 studies demonstrated improved healing in teeth treated with indirect restorations. The fourth study, which favored direct restoration, showed a large discrepancy between the number of enrolled patients in each group, which may have affected the result.

### Conclusion

The high heterogeneity, a significant chance of selection bias and low certainty of evidence make it difficult to place much reliance on the finding associating indirect restorations of root-filled teeth with improved tooth survival. High-quality randomized trials are needed to achieve a consensus on the role of coronal restoration in treatment outcomes.

Kaaber W, Ranjesh B, Kirkevang LL. Effect of type of coronal restoration on periapical healing and tooth survival of root filled teeth: systematic review and meta-analysis. *Aust Endod J* 2025;doi:10.1111/aej.70008.

## Posttreatment Apical Periodontitis And Systemic Inflammation

While blood has traditionally been regarded as an entirely sterile environment, recent studies have identified microbiota and microbial metabolites even in the blood of systemically healthy people. Significantly higher blood-borne bacterial loads in people with periodontal disease suggest that apical periodontitis may exacerbate the systemic inflammatory burden, which may spread extraradicular bacteria into the blood vessels of periapical lesions and then beyond the tooth structure into the general circulation.

Zeng et al from Sichuan University, China, explored and compared the differences between circulating microbial DNA in the blood and microbial DNA in endodontic infections in patients referred for endodontic microsurgery to treat an apical radiolucency after undergoing root canal treatment or retreatment >1 year earlier. Patients with vertical root fractures, pulp cavity exposure to the oral environment or a prior history of trauma, as well as those with severe systemic disease and who had recently used antibiotics or were pregnant, were excluded from the study.

The 11 posttreatment apical periodontitis patients were compared with 9 healthy controls who were free from chronic disease and had not taken any medication during the previous 3 months. Blood samples were taken from the root apex and periapical lesions of the periodontitis patients; both the patients and the controls gave

**Table 2. Most common genera found in different blood samples.**

Healthy controls peripheral blood	Posttreatment apical periodontitis peripheral blood	Posttreatment apical periodontitis periapical lesion	Posttreatment apical periodontitis root apex
<i>Pseudomonadaceae</i>			
<i>Pseudomonas</i>	<i>Rhodococcus</i>	<i>Porphyromonas</i>	<i>Fusobacterium</i>
<i>Prauserella</i>	<i>Shigella</i>	<i>Fusobacterium</i>	<i>Porphyromonas</i>
<i>Rubrobacter</i>	<i>Comamonas</i>	<i>Neisseria</i>	<i>Pyramidobacter</i>

peripheral blood samples. Microbial DNA was extracted from all blood samples and analyzed for the relative abundance, richness, diversity and species differences of bacterial communities.

Circulating microbial DNA of the posttreatment apical periodontitis patients demonstrated a significantly higher alpha-diversity in terms of richness and diversity than that of the controls, with alpha-diversity being greater in periapical lesion samples and peripheral blood than in root apex samples. A comparison of peripheral blood showed distinct microbial communities. The predominant phyla in the blood of patients were *Proteobacteria*, *Actinobacteria* and *Firmicutes*, while *Aliihoeflea*, *Oceanicaulis*, *Comamonas*, *Shigella* and *Acinetobacter* were elevated in patients compared to the controls. The most abundant genera differed depending on the origin of blood samples analyzed (Table 2). For the patients' peripheral blood, root apices contributed approximately one-quarter of the microbiota, whereas periapical lesions contributed approximately three-quarters.

### Conclusion

Although the precise mechanism by which bacterial DNA moves from an endodontic infection into the bloodstream has not been established, a reasonable hypothesis suggests that the highly vascularized tissue of a periapical lesion that forms as part of the

inflammatory response, which demonstrates increased vascular permeability, may be the route. The unique circulating microbial DNA signature in posttreatment apical periodontitis patients indicated the impact of apical periodontitis on their systemic inflammatory burden, reinforcing the need for quality primary endodontic treatment and subsequent intervention for posttreatment apical periodontitis.

Zeng Y, Wang L, Wang M, et al. Post-treatment apical periodontitis: endodontic infection contributes to circulating microbial DNA. *Aust Endod J* 2025;51:298-307.

### In the next issue:

- Correlation between apical periodontitis and preoperative symptoms
- Irrigation techniques to enhance root canal disinfection
- Correlation between dental infections and sinonasal diseases

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. ©2026