A Professional Courtesy of:

Raaed Batniji, DMD
Samir Batniji, DDS

Your ENDODONTIC SPECIALTY

www.endodontic.net

1111 S. Grand Ave., Ste. D
Diamond Bar, CA 91765
909-396-9944 • Fax: 909-396-9984

1111 W. Covina Blvd., Ste. 130
San Dimas, CA 91773
909-592-9197 • Fax: 909-592-8860

9353 Fairway View Place, Ste. 210
Rancho Cucamonga, CA 91730
909-945-5008 • 909-243-7575
Fax: 909-581-6668

Endodontic Treatment Through Existing Restorations

The most commonly reported biological complication associated with full coverage restorations is loss of pulp vitality, with higher rates of complication associated with more esthetically pleasing restorations and younger age of patient at placement. An intact full coverage restoration presents a physical barrier to both primary endodontic treatment and nonsurgical retreatment. While one treatment option involves the removal and replacement of the restoration, a quicker and more economical option would be to perform endodontic treatment through the existing restoration, followed by access cavity repair.

However, this second option brings with it the mechanical risk of crown fracture or loss of retention, along with a biological risk of recurrent caries. To prevent microorganisms from percolating, nonsurgical endodontic procedures in teeth with existing full coverage restorations require a high-quality coronal restoration for the access cavity.

Several in vitro studies have been undertaken comparing control nonaccessed crowns with repaired accessed crowns, but results have not been consistent, meaning best practice guidelines for treating crowned teeth in need of endodontic therapy have not yet been established. Nor has clinical data on the performance of accessed and repaired full coverage restorations been available.

To fill this gap in our knowledge, Abusteit et al from the University of Minnesota reported a case series observational study of 127 patients (aged 33 to 95 years) who underwent endodontic treatment through an existing restoration and returned for follow-up at a 2- to 4-year recall appointment. Full coverage restorations were performed on 4 anterior teeth, 14 premolars and 109 molars. All patients in the cohort had been referred to one endodontic practice and were treated by the same practitioner.

Access through the restoration was gained using carbide burs for gold (5) and metal (1) restorations or diamond burs for zirconia (17) and lithium disilicate (14) restorations. In the case of 74 porcelain-fused-to-metal restorations, diamond burs were used for the porcelain part and carbide burs for the metal

Inside this issue:

framework. After completion of treatment, the access cavity was restored with varying materials, depending on type of full coverage restoration:

- Composite was used for porcelain-fused-to-metal crowns and abutments, zirconia crowns and lithium disilicate crowns.
- Amalgam was used for gold onlays, metal crowns and gold crowns.

One retreated mandibular premolar with a porcelain-fused-to-metal bridge abutment that lacked full circumferential dentin was restored with a fiber post and composite buildup.

At recall, all teeth were asymptomatic and maintained or regained intact lamina dura; all full coverage restorations were clinically and radiographically intact. Failure was reported in 6 cases, including 3 vertical root fractures, 1 horizontal root fracture and 2 restorative failures from extensive recurrent caries. No endodontic failures occurred. Intact retained full coverage restorations healed in 95.3% of cases.

Conclusion

Several factors may limit the applicability of this study's finding, including the fact that all treatment in this case series was performed by a single endodontist in a referral-based practice, which may denote technique sensitivity and limit the applicability of the results in a general dental practice. Nevertheless, the promising results of this case series may serve as a launching point for further multicenter prospective studies of endodontic access through intact full coverage restorations.

Abusteit OE, Hosney S, ElSheshtawy AS, Zapata RO. Outcome of endodontic treatment through existing full coverage restorations: an endodontic practice case series. J Endod *2022; 48:388-395.*

Maxillary Posterior Teeth and the Sinus Floor

Endodontic microsurgery is a viable treatment option, especially after failure of nonsurgical endodontic treatment, with an excellent success rate. However, when performing endodontic microsurgery on maxillary posterior teeth, perforation of the maxillary sinus may occur, with a reported incidence of 23% in the case of molars. Such perforation increases the risk of the patient's developing sinusitis. Therefore, surgeons need to understand the relationship between the apices of posterior teeth and the maxillary sinus.

In a recent study, Wang et al from the Affiliated Nantong Stomatological Hospital of Nantong University, China, proposed identifying a line perpendicular to the buccal bone surface and connected to the root apex as the surgical access line (SAL). This line allowed the authors to analyze the relationship of surgical access in maxillary premolars with the maxillary sinus floor, which in turn could provide a reference for the preoperative assessment of endodontic microsurgery difficulty.

The authors studied 190 cone-beam computed tomography (CBCT) images of maxillary posterior teeth taken from patients ranging in age from 21 to 76 years. They divided the relationship between the SAL of maxillary molars and premolars with the maxillary sinus into 3 groups:

- **Type I:** the SAL was below the maxillary sinus floor
- **Type II:** the SAL was in contact with the maxillary sinus floor
- **Type III:** the SAL protruded into the maxillary sinus

For type I relationships, the distance between the SAL and the maxillary sinus floor was measured on both the coronal and the sagittal sections, with the smaller value defined as the controlling distance.

The distance between the SAL and the maxillary sinus floor increased in older patients (Table 1). Type II and type III relationships were quite rare in first premolars (>3%); however, the incidence increased to 24% in second premolars and 34% in first molars. Teeth with distances between the SAL and the maxillary sinus floor of ≤2 mm, considered at high risk for maxillary sinus perforation during endodontic microsurgery, made up 13% of first premolars, 43% of second premolars and 52% of first molars.

Conclusion

The use of CBCT imaging in pretreatment planning for endodontic microsurgery allows the practitioner to more accurately see the relationship between teeth in need of treatment and adjacent anatomic structures such as the maxillary sinus. Given that one-quarter of second premolars and one-third of first molars were classified as

Table 1. *Average distance between the maxillary sinus floor and the surgical access line by age of patient.*

Age (years)	Distance
21–30	3.65 mm
31–40	3.40 mm
41–50	4.16 mm
51–76	5.99 mm

type III, with the SAL protruding into the maxillary sinus, the prudent course for these cases might be to develop other treatment plans to avoid potential sinus perforation.

Wang S, Wang X, Jiang J, et al. Relationship between the surgical access line of maxillary posterior teeth and the maxillary sinus floor. J Endod *2022;48:509-515.*

Indicators for Endodontic Treatment After Crown Cementation

Teeth may require crowns for a variety of nonendondontic reasons—biologic, esthetic, prosthodontic—often on teeth with extensive previous dental history. Pulpal disease development after crown cementation presents a challenge for successful endodontic treatment.

Previous studies have failed to reach a consensus on the incidence of endodontic treatment in teeth receiving a single unit or bridge abutment fixed prosthesis. At least one study reported that as many as half of all cases treated by endodontists involve teeth with crowns. But few studies have reported specific factors that may contribute to primary endodontic disease in crowned teeth, and those studies have shown conflicting results.

Won from the University of Toronto, Ontario, and Berlin-Broner from the University of Alberta sought to identify the factors associated with increased risk of root canal treatment in nonendodontically treated teeth after crown cementation while establishing a timeline for this scenario. To create a case-control study, they reviewed the records of all nonendodontically treated teeth restored with a single-unit permanent crown at a university-based dental clinic over a 20-year period.

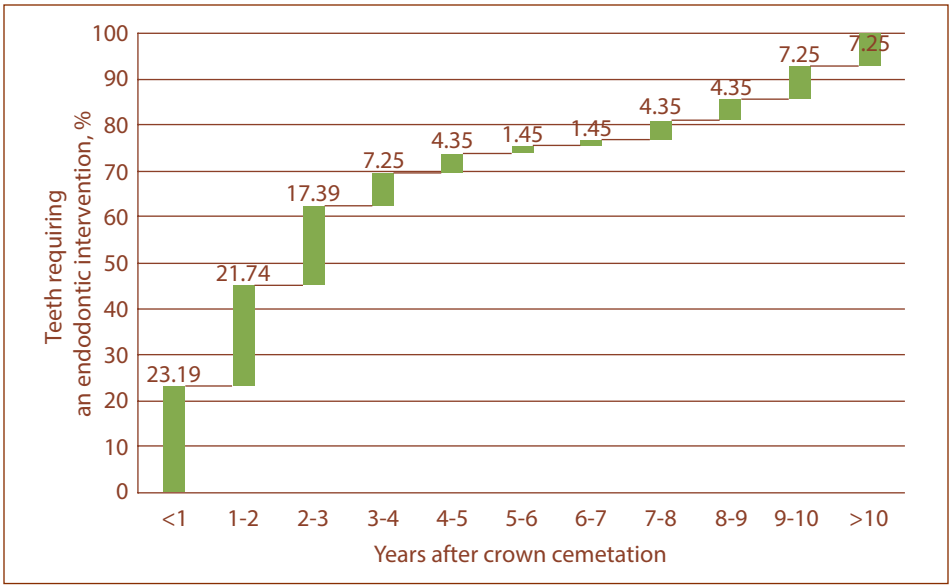

Figure 1. The time to an endodontic intervention after permanent crown cementation. Distribution among the "cases" (total = 69) according to the time point when an endodontic intervention was required (years after permanent crown cementation). In almost a quarter (n = 17) of the cases, the endodontic intervention was required within the first year after crown cementation. The majority (62%; n = 43) of the interventions were required within the first 3 years, with a mean ± standard deviation of 3.85 ± 3.84 years after crown cementation.

Crowned teeth that subsequently underwent root canal treatment or were diagnosed with symptomatic apical periodontitis, asymptomatic apical periodontitis, chronic apical abscess or acute apical abscess were considered cases. Each of the 69 cases was matched by type of tooth, age and follow-up time with a control group that did not require any endodontic intervention.

Variables analyzed included type and number of previous restorations, along with number of surfaces restored; type of restorative material used (if applicable); a history of base, liner or pin placement; a history of crown lengthening or orthodontic treatment; and a history of trauma before crown placement. The majority of teeth were molars, followed by premolars.

Teeth with ≥2 restorations before crown cementation were nearly 4× as likely to require subsequent endodontic treatment than were teeth with ≤1 restoration; teeth with ≥3 restorations before crown cementation were nearly 6× as likely to require subsequent endodontic treatment. No other variable had a significant impact. One-quarter of the cases underwent endodontic treatment within 1 year after crown cementation; a majority of cases were treated within 3 years (Figure 1).

Conclusion

The small number of teeth involved in this study makes drawing large-scale conclusions problematic. The impact of several potentially confounding variables (e.g., dentin thickness, presence of cracks, operator technique) could

not be evaluated. Until larger prospective studies are undertaken, it may be prudent to refer patients undergoing crown cementation on teeth with ≥2 restorations for a pretreatment endodontic consultation.

Won K, Berlin-Broner Y. Factors associated with the need for a primary endodontic treatment after single-unit crown cementation: a retrospective case-control study. J Endod *2022; 48:730-735.*

Retrieving Separated Instrument Fragments

An unfortunate possibility related to the use of rotary nickel–titanium (NiTi) instruments is separation within the root canal. Inadequate cleaning of the root space apical to a separated endodontic instrument may result in an unfavorable result, while retreatment for periapical lesions is less successful if an instrument fragment has not been removed. While preventing instrument fracture is the optimal goal, the occasional separation appears unavoidable.

Several factors influence successful removal of separated instruments. Fragments located before the canal curvature are more easily removed than are those located in the curvature, which in turn are more easily removed than are those located beyond the curvature. Successful removal of separated instruments is more likely in teeth with smaller curvatures and longer radii. The optimal strategy is use of ultrasonic tips and a dental operating microscope. But no standardized procedure for removing separated instruments from the canal currently exists.

One unknown involves the time required to remove a separated instrument with respect to the length of the fragment and the curvature of the canal. Terauchi, a private practitioner from Japan, et al undertook a study of clinical cases to determine the significant factors that influence the time needed to loosen and remove the separated instrument. They looked at 128 retreatment cases referred by general practitioners to a private endodontic practice involving teeth with retained instrument fragments. All cases presented with radiographic evidence of apical pathosis and were diagnosed with symptomatic or asymptomatic apical periodontitis.

After images of the affected tooth using both cone-beam computed tomography (CBCT) and periapical radiographs were captured, restorative and root-filling materials were removed, and the canal was enlarged. Ultrasonic tips were used to create a semicircular space on the inner curve of the canal wall at the site of the separated instrument to a depth of approximately one-third of the fragment. For fragments measuring <4.5 mm on CBCT imaging, the operator employed ultrasonic instruments to retrieve the fragment. For longer fragments or if the fragment failed to come out within 10 seconds, retrieval using a loop or an XP Shaper (FKG Dentaire SA, La Chaux-de-Fonds, Switzerland) was attempted.

Of the 128 separated instruments, 114 were removed using only ultrasonic tips; 13 required using a loop, while 1 required the use of the XP Shaper. Fragments retrieved using ultrasonics measured up to 5.7 mm; all fragments that required the use of a loop measured ≥6.4 mm. Those measuring >4 mm in canals with curvatures >30° required ≥5 minutes to loosen during the preparation phase but then <1 minute to remove. Almost all the fragments measuring <4.6 mm needed ≤10 seconds to remove after preparation was completed. Preparation time increased by 162% with each 1-mm increase in length and by 4% for each 1-degree increase in root canal curvature.

Conclusion

One finding of interest outside the stated goals in this study was that all patients who attended their 6-month recall appointment demonstrated either complete or partial resolution of apical pathosis. This emphasizes the need to retrieve any separated instrument fragments to help ensure a successful endodontic treatment result.

Terauchi Y, Sexton C, Bakland LK, Bogen G. Factors affecting the removal time of separated instruments. J Endod *2021;47:1245-1252.*

In the next issue:

- Pain management of acute apical abscess
- Management of cracked teeth with reversible pulpitis
- One or two-visits root canal retreatment

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.