Survival Rates of Teeth with Primary Endodontic Treatment after Core/Post and Crown Placement

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Abstract

Introduction: The objective of this study was to determine the effect of delayed placement of the core/post and crown on the outcomes of nonsurgical root canal therapy (NSRCT). **Methods:** According to the Delta Dental of Wisconsin claims database, 160,040 NSRCTs were completed with a core/post and a crown placed before the end of the continuous coverage period or occurrence of an untoward event. Untoward events were defined as a retreatment, apicoectomy, or extraction as defined by the Code on Dental Procedures and Nomenclature. Statistical analysis was performed by using a multivariable Cox proportional hazards model. **Results:** The survival rate from the time of crown placement to an untoward event was 99.1% at 1 year, 96.0% at 3 years, 92.3% at 5 years, and 83.8% at 10 years. Failure rates were greater when a core/post was placed more than 60 days after the NSRCT (adjusted hazard ratio, 1.08) and when the crown was placed more than 60 days after the core/post placement (adjusted hazard ratio, 1.14). Overall, the survival rates of NSRCT were greater when performed by an endodontist versus other providers. **Conclusions:** On the basis of the information available from insurance claims data, this study shows that the long-term survival rates of initial endodontic therapy are adversely affected by the delayed placement of the final restoration and full coverage crown. *(J Endod 2017;■:1–6)*

Key Words

Core, outcomes, post, root canal therapy, time interval

Significance

The long-term survival rates of initial endodontic therapy are significantly higher when the core/post is placed within 60 days after NSRCT and the crown is placed within 60 days after the core/post.

With more than 15 million root canal treatments being performed in the United States each year, there is an emphasis on understanding the parameters that influence the prognosis of the treatment (1, 2). Although the dual chemomechanical procedure of nonsurgical root canal therapy (NSRCT) is paramount to the long-term survival of the tooth, it can be argued that a permanent restoration is the final phase of endodontic therapy. Failure to adequately combat the coronal destruction that has occurred because of caries, access preparation, fractures, or previous restorative therapies decreases the capacity of a tooth to resist functional and parafunctional forces (3). These macroscopic changes assert cumulative effects, causing a decrease in the overall cuspal stiffness of an endodontically treated tooth (4). This is evident because the 10-year survival of a root canal–treated tooth restored with a crown was 81% versus 63% for a root canal–treated tooth with a direct restoration (5). An epidemiological study focusing on patients with Delta Dental insurance found 97% retention of teeth with NSRCT at 8 years. However, further analysis illustrated that the failed extracted teeth lacked a full coverage restoration in 85% of the cases (6). In a subsequent epidemiological study performed by Lazarski et al (7), the failure rate of NSRCT was 5.56%. There was a 4 times greater incidence of extraction with teeth that did not have any permanent restoration placed.

A recent study (8) evaluated the influence of a time lapse between endodontic therapy and the placement of a coronal restoration among patients treated in the dental school setting. In this study, teeth that had received a crown at more than 4 months after NSRCT were 3 times more likely to get extracted compared with teeth that received the crown within 4 months of NSRCT. There has been no recent literature that addresses the population that would be encountered in the private practice setting. The purpose of the present study was to investigate the effect of a delayed placement of the core/post and crown on the outcome of NSRCT by using long-term, large-scale data pulled from a privately insured patient population.

Materials and Methods

The data for this study was obtained from the electronic insurance claims record and enrollment database of Delta Dental of Wisconsin. The database included 13,329,249 patient encounters that occurred between January 1, 2000 and December

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31, 2013. Of the total patient encounters, 476,479 initial NSRCT procedures were completed. All dental insurance claims for individuals receiving NSRCT were extracted and analyzed from the database. The data were further restricted to 160,040 patients who had received NSRCT, core or post and core (core/post), and crown by the end of the continuous coverage period or the incidence of an untoward event. Untoward events were defined as having a retreatment, apicoectomy, or extraction that was based on submitted Codes on Dental Procedures and Nomenclature, indicating failure of the initial NSRCT (9). NSRCT was considered successful until the occurrence of the untoward event or a lapse in the patient's enrollment status. For each patient, characteristics were obtained and collected for further analysis (Fig. 1).

Data analysis was completed by using SAS 9.4 (SAS Institute Inc, Cary, NC) software. Hazard ratios were calculated by using a univariate Cox proportional hazards model. From these data, adjusted hazard ratios (aHRs) were calculated by using a multivariable Cox proportional hazards model to account for other covariates and predictors. Survival estimates were calculated at 1, 3, 5, and 10 years on the basis of the presence of the tooth with the NSRCT, core/post, and crown without incidence of an untoward event or break in the continuous enrollment period.

The study was submitted to Marquette University's Institutional Review Board. However, it was determined that the study did not meet the criteria for human subjects, and a review by the Institutional Review Board was not required.

Results

The survival rate was 99.1% at 1 year, 96.0% at 3 years, 92.3% at 5 years, and 83.8% at 10 years for all tooth types.

In the present study, the case distribution consisted of 88,666 molar teeth (55.4%), 50,246 premolar teeth (31.4%), and 21,128 anterior teeth (13.2%) (Table 1). Statistical analyses showed a significant difference in incidence of an untoward event that was based on tooth type (Table 2).

The NSRCT was completed by an endodontist who graduated from an American Dental Association accredited United States endodontic residency program in 46,984 cases (29.4%) and by other providers in 113,056 cases (70.6%) cases (Table 1). A greater incidence of an untoward event was associated with NSRCT completed by other providers versus endodontists, as signified by aHR of 1.43 (Fig. 2).

The mean age at the time of NSRCT was 44.6 years, with a standard deviation of 13.4. Ages ≤17 years comprised 4087 cases (2.6%), ages 18–35 comprised 37,531 cases (23.5%), ages 36–53 comprised 73,965 cases (46.2%), ages 54–71 comprised 42,231 cases (26.4%), and ages ≥71 years comprised 2216 cases (1.4%) (Table 1). As the ages of the groups increased, there was a greater incidence of untoward events (Table 2).

Role of Core/Post Material

After NSRCT, 99,005 teeth (61.9%) had a core placed, and 61,035 teeth (38.1%) had a post and core placed. Core materials were composed of 8801 amalgam restorations or metallic inlays (5.5%), 13,879 direct composite resins (8.7%), 2 ceramic inlays (0.0%), and 76,323 core buildups (47.7%) (Table 1). Direct resin-based cores illustrated a greater risk of failure after controlling for other variables compared with amalgam restorations, as indicated by aHR of 1.16. Core buildups and amalgam restorations did not show any significant difference in failure rates (Table 2). Ceramic inlays were excluded from the remainder of the study because of the small sample size. Types of posts consisted of 9391 indirectly fabricated posts (5.9%) and 51,644 prefabricated posts (32.3%) (Table 1). The teeth that were treated with post and core versus a core showed a higher rate of failure, and indirectly fabricated posts demonstrated a greater risk of failure compared with prefabricated posts, as seen by aHR of 1.11 (Table 2).

Role of Crown Material

Metallic crowns were placed on 127,929 teeth (79.9%) and consisted of porcelain fused to metal, ¾ cast metal, full cast metal, titanium crowns, and their counterparts used as retainer crowns for fixed partial dentures. Non-metallic crowns were placed on 31,477 teeth (19.7%) and consisted of porcelain and ceramic crowns and their counterparts used as retainer crowns for fixed partial dentures. Stainless steel crowns

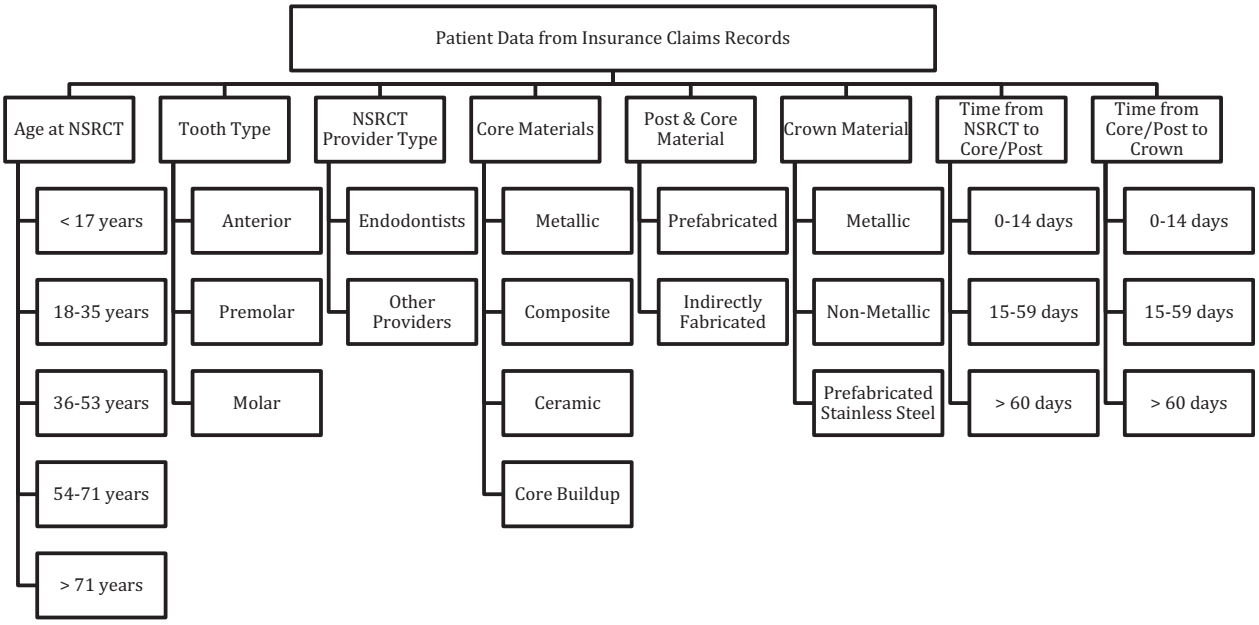

Figure 1. Analyzed characteristics of insurance claims records for each patient.