

Rubber Dam Use during Post Placement Influences the Success of Root Canal–treated Teeth

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Abstract

Introduction: Salivary leakage after root canal therapy is of great concern and can lead to failure of the endodontic therapy. The aim of this study was to investigate whether the use of a rubber dam (RD) during post placement impacts the success of root canal–treated teeth. **Methods:** Retrospective chart reviews of 185 patients with an average recall of 2.7 years were assessed for the incidence of a new periapical lesion (periapical index score >2) after root canal therapy and post placement. The patients were divided into 2 groups based on the presence or absence of an RD clamp in the verification radiograph during post placement. **Results:** Twenty-six patients (30 teeth) had a post placed with the use of an RD, and 159 patients (174 teeth) had a post placed without an RD. In the non-RD group, 128 (73.6%) teeth were considered successful at follow-up. In the RD group, 28 (93.3%) teeth were considered successful at follow-up. Based on the bivariate GEE model, the difference in success between these 2 groups was statistically significant ($P = .035$). **Conclusions:** The use of an RD during prefabricated post placement provides a significantly higher success rate of root canal–treated teeth. Using an RD is already considered a standard of care for nonsurgical root canal therapy; in addition, using an RD during restorative procedures that involve open teeth should also become a standard of care. (*J Endod* 2013;39:1481–1484)

Key Words

Endodontic therapy, prefabricated post and core, root canal treatment, rubber dam

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It has been long established that oral bacteria are responsible for pulpal and periapical disease (1) and are the primary etiologic factors associated with root canal failure (2–4). Salivary bacteria gain access to the root canal system through coronal leakage both while the tooth is restored temporarily and permanently (3). Although it has been shown that a well-obtured root canal helps to delay the recontamination of the root canal system (5), it is only a temporary barrier, and nearly the entire length of the root canal can be recontaminated within as short as 72 hours in the presence of coronal leakage (6, 7). This is the shortest time period tested, and it may be possible that significant contamination could be caused by coronal salivary exposure occurring in an even shorter time period.

During the process of post placement without the use of rubber dam isolation by dental practitioners, root canal–treated teeth are potentially exposed to saliva and subsequent microbial contamination. The lack of tooth isolation and an extended procedural time period, including radiographs and post space preparation, allow the patients to open and close their mouths, bathing the pulp chamber and root canal in saliva.

The use of a rubber dam (RD) is the standard of care for root canal treatment. According to the American Association of Endodontists position statement, “Tooth isolation is the standard of care; it is integral and essential for any nonsurgical endodontic treatment... only the dental dam isolation minimizes the risk of contamination of the root canal system by indigenous oral bacteria” (8). According to Ingle et al (9) in the Washington Study, a significant cause of root canal failure is inadequate cleaning and obturation of the root canal system, which leaves behind bacteria. The protocol followed for root canal therapy with the use of the RD can be negated once the restorative dentist exposes a recently cleaned and obtured root canal to indigenous oral bacteria during post placement without an RD.

To the authors’ knowledge, the impact of coronal leakage during post placement has never been investigated, and it has become common practice for dentists and dental students to place a restoration after root canal therapy, including a post, without the use of an RD. Following an aseptic technique used during root canal therapy, the practitioner often abandons the use of the RD in favor of convenience, thus allowing contamination of the obtured pulp chamber and coronal aspects of the obtured root canals. The purpose of this study was to investigate whether the use of an RD in the placement of a prefabricated post and core impacts the success of root canal–treated teeth.

Materials and Methods

Institutional review board approval was obtained from Tufts University, Boston, MA. All electronic data were kept on a password-protected computer and were only available to the study investigators. Each subject was assigned a unique numeric identifier, which allowed coding of data for analysis. Data were queried based on American Dental Association codes for root canal treatment and post placement by Tufts University Department of Information Technology. No specific patient identifiers were collected. All research was conducted at Tufts University School of Dental Medicine (TUSDM).

Eight hundred forty-six patients treated at TUSDM undergraduate and postgraduate endodontic clinics during the period of 2008–2011 comprised the study population. During this period, root canal therapy was completed, and, subsequently, a prefabricated post and core was used to restore the tooth by an undergraduate dental

student before crown placement. Because of the retrospective nature of this study, no attempts were made to standardize the techniques by which root canal therapy or obturation were completed. However, all treatment can be assumed to have been done with techniques being taught at the time, which included step-back hand instrumentation with lateral condensation for the patients treated before the fall of 2010 and rotary instrumentation with continuous wave vertical condensation after that time. All treatment, although it was performed by various providers, was supervised by experienced endodontic faculty and residents. Patient records from the Axiom dental charting system (Exan Group, Coquitlam, British Columbia, Canada) were reviewed to assess the periapical status of the tooth at the time of post placement and again at a recall period of at least 6 months to 6 years.

Inclusion criteria included the following:

1. Records had to be available for patients who had root canal therapy completed by undergraduate and graduate students at TUSDM within the time period indicated.
2. The tooth did not have a periapical lesion or a widened periodontal ligament (PDL) greater than twice the width of an adjacent health PDL (periapical index [PAI] score 1 or 2 only) (10).
3. Only endodontic cases of good quality were selected for evaluation.

Good quality was defined as “all canals were obturated, no voids were present, and fill of the main gutta-percha point was within 0.0–2.0 mm from the radiographic apex” (11). Exclusion criteria were as follows:

1. Teeth with a periapical lesion as determined by the presence of periapical radiolucency beyond that of a widened PDL ($>2 \times$ PDL width) at the time of root canal treatment and post placement (PAI 3–5)
2. Patients without a follow-up radiograph of at least 6 months
3. Teeth extracted within the first 6 months after root canal therapy
4. Cases in which procedural errors (perforation, separated file, and transportation) occurred during post placement that resulted in extraction or decreased prognosis
5. Teeth with development anomalies, immature roots, and crown or root fracture

The charts and radiographs of patients were reviewed to determine eligibility. For charts meeting the inclusion criteria, the following data were recorded:

1. The presence of an RD clamp in the post placement verification radiograph, thus indicating the use of an RD during post placement (Fig. 1)
2. The presence or absence of periapical radiolucency upon the most recent recall examination not to be less than 6 months after post placement

The presence of periapical radiolucency, a PDL space wider than 2 times its normal width, or evidence of extraction at the time of recall, was determined as treatment failure.

Data collection was completed by 2 of the authors. The determination of a pre- and postoperative lesion was determined at the time of data collection and also by a third observer. The third observer was blinded to whether or not an RD was used by blocking out the coronal portion of the radiograph at the time of evaluation. All radiographs were projected to approximately 2×1.5 ft on a 9-foot screen and viewed under darkened lighting conditions. All disagreements were resolved by discussion among the 3 clinician investigators; if no consensus was reached, the tooth was excluded from analysis.

The follow-up radiographs were collected at the time of data collection and later evaluated for the presence of a postoperative lesion. At the time of the evaluation, none of the observers were aware of the RD isolation status of the follow-up radiograph being evaluated.

Statistical Analysis

A power calculation was conducted using nQuery Advisor (Version 7.0; Statistical Solutions, Saugus, MA). Assuming a 91% survival rate in the RD group and a 44% survival rate in the non-RD group (11), a sample size of at least 20 patients with an RD post placement and at least 100 patients with a non-RD post placement was determined to be adequate to obtain a type I error rate of 5% and a power greater than 90%.

Descriptive statistics (counts and percentages for categorical variables and means and standard deviation [SD] for continuous variables) were calculated. To account for the existence of multiple treatments on the same patient, statistical significance was assessed via generalized estimating equations (GEEs). A bivariate GEE model was used to test the association between the type of placement (RD or no RD) and success. A multivariate GEE model was also run to adjust for the number of years to follow-up. *P* values $<.05$ were considered statistically

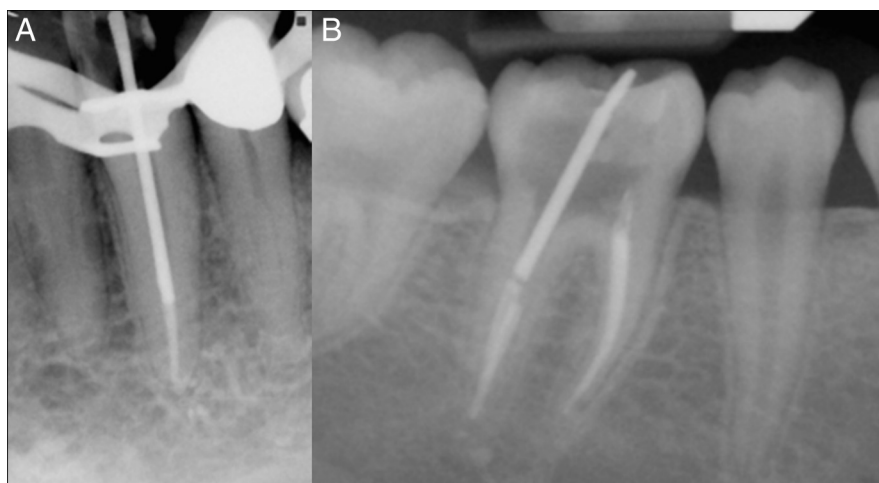


Figure 1. A typical post verification radiograph showing the (A) presence and (B) absence of an RD clamp. This is an example of a case that was included in the RD group.

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