Epidemiologic Evaluation of the Outcomes of Orthograde Endodontic Retreatment

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Abstract

Introduction: Teeth undergoing initial endodontic therapy have a very high survival rate. Some teeth that continue to show signs of pathosis after the initial therapy will require nonsurgical (orthograde) retreatment. Outcome assessment of endodontic retreatment is crucial for appropriate case selection and treatment planning. However, reports on outcomes of orthograde endodontic retreatment performed by endodontists are limited in number, and the reported data vary. In this study, outcomes of orthograde endodontic retreatment performed on 4744 teeth were assessed during a period of 5 years. **Methods:** Data were obtained from retreatments that were performed by endodontists participating in the Delta Dental Insurance plan that insures approximately 15 million individuals in the USA. **Results:** Overall, 89% of teeth were retained in the oral cavity 5 years after the endodontic retreatment. Four percent of all teeth underwent apical surgery that occurred mostly within 2 years from completion of orthograde retreatment. Eleven percent of teeth were extracted at the end of the 5-year observation period. **Conclusions:** It appears that orthograde endodontic retreatment yields high incidence of tooth retention after 5 years. *(J Endod 2010;36:790–792)*

Key Words

Endodontic epidemiology, endodontic outcome, endodontic prognosis, endodontic retreatment, tooth retention, tooth survival

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Endodontic therapy is a conservative treatment modality yielding a high long-term tooth survival rate (1–5). However, some teeth that have undergone initial endodontic therapy might present persistent pathosis, and the patient's signs or symptoms might not resolve after the treatment. Failure of the initial treatment could be due to persistent infection from untreated canals, undiagnosed cracks, cystic lesions, extraradicular biofilms (ie, actinomycosis, etc), foreign body reaction to some extruded material, iatrogenic perforation, and cholesterol crystals in apical tissues (6–16). Management of post-treatment pathosis includes orthograde retreatment, apical surgery, or intentional reimplantation. Often, orthograde retreatment is the preferred choice of treatment because it is the least invasive approach.

Outcome studies of orthograde endodontic retreatment are limited in number and vary considerably in design, treatment protocols, and methodology as well as in recall rates and duration of the observation periods. Of the most contemporary studies (17–24), only four (20, 21, 23, 24) used current techniques and presented relevant evidence base for retreatment outcomes.

To date, no epidemiologic study has assessed endodontic retreatment outcomes in large patient populations. Such studies might enable a more realistic analysis of large population response to the therapy and provide clinicians with better assessment of tooth prognosis and selection of appropriate treatment protocol.

The purpose of this study was to analyze retrospectively the outcomes of endodontic retreatment and associated tooth survival during a follow-up period of 5 years.

Materials and Methods

Data were obtained from the Delta Dental Insurance Data Center. This company insures more than 15 million individuals in 50 states across the USA. It has maintained a computerized database of its claims since 1993.

The protocols and guidelines of evidence-based medicine for prognosis and outcome analysis were followed (25). These included analysis of a large patient population, common point for analysis initiation, long follow-up period, blind outcome criteria, and less than 5% loss in patient pool. Subsequently, a sample of patient population assembled at a common point in the course of endodontic retreatment was analyzed. This point was determined as the completion date of the root canal retreatment as reported to the Delta Dental Data Center. The patients' treatment data were collected continuously for 5 years in the database, and outcome criteria were applied blindly because none of the endodontists submitting the claims were aware that the data would be used for an endodontic outcome analysis in the future.

Patients included in this study were enrolled in the dental plan for a continuous period from 2000–2007, and all endodontic retreatments were performed by endodontists.

A total of 4744 nonsurgical retreatment procedures were analyzed by making a query for the specific American Dental Association (ADA) procedure code for retreatment. Procedure 3346 is the ADA code for nonsurgical retreatment in maxillary and mandibular anterior teeth, procedure 3347 is the code for nonsurgical retreatment in maxillary and mandibular premolars, and procedure 3348 is the code for nonsurgical retreatment in maxillary and mandibular molars.

The occurrence of additional procedures after the retreatment such as apical surgery and extraction were analyzed by making a query for the ADA procedure codes 3410, 3421, 3425, 7110, 7120, and 7210. Procedure 3410 is the ADA code for apical

TABLE 1. Outcome of Orthograde Endodontic Retreatments in Maxillary and Mandibular Anterior Teeth (n = 964)

Additional procedures performed after retreatment	0–12 mo	13–24 mo	25–36 mo	37–48 mo	49–60 mo	Cumulative total (% of total)
Apical surgery	24	27	7	3	3	64 (6.6)
Extraction	9	17	11	17	14	68 (7)

Of the teeth above, 10 teeth underwent both procedures.

surgery in maxillary and mandibular anterior teeth, procedure 3421 is the code for apical surgery in maxillary and mandibular premolars, and procedure 3425 is the code for apical surgery in maxillary and mandibular molars. Procedures 7110, 7120, and 7210 are the ADA codes for tooth extraction as related to the degree of difficulty of the procedure.

After completion of the retreatment, the teeth were tracked in the database during the entire period, and the percentages of teeth that were retained or underwent additional procedures such as apical surgery or extraction were recorded.

Results

Overall, 89% of all teeth were retained in the oral cavity after nonsurgical endodontic retreatment. Four percent of all teeth underwent apical surgery, and 11% were extracted at the end of the 5-year observation period.

Anterior Teeth

At the end of the 5-year observation period of 964 anterior teeth, 54 teeth underwent apical surgery, 58 teeth were extracted, and 10 teeth underwent apical surgery followed by an extraction.

Of 964 anterior teeth, 896 (93%) were retained, 122 (13%) had additional procedures, whereas 842 (87%) did not undergo any additional procedures after orthograde retreatment (Table 1).

Premolar Teeth

At the end of the 5-year observation period of 858 premolar teeth, 33 teeth underwent apical surgery, 92 teeth were extracted, and 4 teeth underwent apical surgery followed by an extraction.

Of 858 premolar teeth, 762 (89%) were retained, 129 (15%) had additional procedures, whereas 729 (85%) did not undergo any additional procedures after orthograde retreatment (Table 2).

Molar Teeth

At the end of the 5-year observation period of 2922 teeth, 82 teeth underwent apical surgery, 335 teeth were extracted, and 22 teeth underwent apical surgery followed by an extraction.

Of 2922 molar teeth, 2565 (87%) were retained, 439 (15%) had additional procedures, whereas 2483 (85%) did not undergo any additional procedures after orthograde retreatment (Table 3).

Discussion

This study attempted to analyze the outcomes of endodontic retreatment from an epidemiologic perspective, considering tooth survival in the oral cavity as evidence of treatment success. Observation of a large patient population during a 5-year period revealed a high survival rate of teeth after endodontic retreatment performed by endodontists, regardless of the etiology, specific treatment technique, tooth group, or special patient characteristics. Overall, 89% of teeth were retained in the oral cavity for 5 years after completion of endodontic retreatment.

Our findings are in agreement with other studies indicating that the chance of endodontically retreated teeth to remain functional over time is very high (20, 21). One of these studies reported that of teeth retreated without preoperative radiolucency, 93% remained free of disease, and 96% were asymptomatic and functional (21). Of teeth that had preoperative radiolucency, 80% healed and 93% were asymptomatic and functional.

Two recent systematic literature reviews reported that general practitioners and students were the operators in half of the retreatment studies in the literature (26, 27). Specialists' involvement was reported in only one fourth of the studies. One review found a combined weighted functional rate of 78.8% for orthograde retreatment and concluded that new studies were needed to better assess retreatment outcomes performed by specialists with current techniques and materials, ie: surgical microscope, ultrasonic instruments, mineral trioxide aggregate for treatment of perforation and open apex situations, and electronic apex locators (27). The present study has attempted to address this lack of data in the literature by selecting retreatments that were done only by endodontists.

Overall, 4054 of 4744 retreated teeth (85%) did not require any additional procedures such as apical surgery or extraction after endodontic retreatment. A decrease in number of apical surgeries and increase in extractions from anterior to posterior teeth were observed. This might be explained by an increase in the level of complexity of retreatment procedures associated with posterior teeth.

Most endodontic pathosis followed by additional interventions such as apical surgery or extraction was recognized within the first 2 years after retreatment (Tables 1–3). This is in agreement with previous reports (3, 5, 28). Of the teeth undergoing apical surgery, anterior teeth were the predominant group (6.6%), followed by premolars (4.3%) and molars (3.6%). Of the teeth extracted after retreatment, molars were the predominant group (12.2%), followed by premolars (11.2%) and anteriors (7%).

It is most likely that such additional procedures might have resulted from unresolved signs and symptoms, failing restorative treatment, root fractures, and/or iatrogenic causes. However, this specific information could not be obtained from the Delta Dental database.

Although this study could not determine the presence or degree of apical periodontitis associated with the analyzed teeth, it seems that the

TABLE 2. Outcome of Orthograde Endodontic Retreatments in Maxillary and Mandibular Premolar Teeth (n = 858)

Additional procedures performed after retreatment	0–12 mo	13–24 mo	25–36 mo	37–48 mo	49–60 mo	Cumulative total (% of total)
Apical surgery	16	15	1	2	3	37 (4.3)
Extraction	17	27	27	12	13	96 (11.2)

Of the teeth above, 4 teeth underwent both procedures.

TABLE 3. Outcome of Orthograde Endodontic Retreatments in Maxillary and Mandibular Molar Teeth (n = 2922)

Additional procedures performed after retreatment	0–12 mo	13–24 mo	25–36 mo	37–48 mo	49–60 mo	Cumulative total (% of total)
Apical surgery	46	31	13	7	7	104 (3.6)
Extraction	70	100	77	62	48	357 (12.2)

Of the teeth above, 22 teeth underwent both procedures.

majority of endodontic retreatments were successful in addressing the symptoms of endodontic disease, enhancing patient motivation for tooth retention.

In conclusion, it appears that endodontic retreatment is a procedure with a very good survival rate. The high tooth retention rate after 5 years might well be associated with tooth functionality and patient comfort. Patients considering orthograde endodontic retreatment can be advised that 89% of these teeth might be retained and functional at least 5 years after the procedure.

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