

A Prospective Study of the Extraction and Retention Incidence of Endodontically Treated Teeth with Uncertain Prognosis after Endodontic Referral

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Abstract

Introduction: The present study was conducted with the aim to assess the extraction and retention incidence of endodontically treated teeth with an uncertain prognosis after endodontic referral and to evaluate the factors related to the decision-making process.

Methods: Two hundred seventy-five permanent teeth were clinically and radiographically evaluated by 3 experienced endodontists. The type of tooth, age and sex of the patients, the motive of referral, and the main chief complaint were the initial recorded data. The associations between extraction reasons and the patients' age and sex or tooth type were analyzed using the chi-square test. **Results:** Of the 275 teeth examined, 217 (79%) were finally extracted. The remaining 58 (21%) teeth were endodontically retreated and restored. A questionable clinical status was the main motive for endodontic referral (57.1%). The teeth most extracted were maxillary molars (36.2%) followed by mandibular molars (32.9%). The most prevalent reason for extraction was nonrestorable caries (37.1%). The majority of the teeth retained in the oral cavity needed surgical periodontal or endodontic management. **Conclusions:** The most frequent reason responsible for the fate of endodontically treated teeth is the pronounced loss of dental tissues. Endodontic referral may aid in the survival of some carefully selected cases of endodontically treated teeth. (*J Endod* 2012;38:1326–1329)

Key Words

Endodontically treated teeth, extraction, rationale, retention

The prevention and treatment of apical periodontitis is the main long-term purpose of root canal therapy (1). The optimal results of endodontic treatment are the healing of periradicular tissues and the achievement of functionality of the treated teeth (1, 2). The progress and continuous development of endodontic operative techniques have significantly contributed to those purposes offering a lot of benefits to the clinician trying to achieve an appropriate treatment outcome (3–5).

Nevertheless, in everyday clinical practice, clinicians may decide to extract an endodontically treated tooth for a number of reasons. Extraction still retains its validity as a treatment option despite our improved knowledge about the biological and clinical factors that determine the prognosis of an endodontically treated tooth and the advancement of novel endodontic techniques and materials (6–8).

Despite the fact that many clinical studies have been performed dealing with the success and failure of endodontic treatment, only a few have focused on the reasons that might cause the loss of endodontically treated teeth (9–12). The majority of these studies have retrospectively found that the major issue regarding the retention of endodontically treated teeth was the questionable or poor expected restorative outcome. Periodontal disease and endodontic treatment failure were the other 2 most prevalent reasons for extraction, whereas a significant proportion of teeth were extracted because of the presence of a vertical root fracture (9–13).

A recent prospective study has analyzed this issue with a different and more detailed approach, but the results were based on questionnaires answered by general dentists (12). It is also noteworthy that none of these studies has taken into consideration patients' wishes as an additional option for the decision-making process. Financial issues and patients' related factors (ie, preference and autonomy) appear to be the 2 main reasons that sometimes lead patients to decide to have teeth extracted rather than undergoing endodontic retreatment or periradicular surgery. Moreover, in a study like this, it is very important to collect data from endodontists in order to obtain more precise information about the clinical and radiographic status of the teeth and also to secure that all treatment options were exhausted before tooth extraction. The aim of the present study was prospectively 2-fold: first, to evaluate the extraction incidence of endodontically treated teeth with an uncertain prognosis after endodontic referral and second to define all the related factors affecting the decision for extraction and retention of the same teeth.

Materials and Methods

Data were gathered from 275 endodontically treated permanent teeth of 270 patients referred to 3 different endodontic offices for clinical and radiographic evaluation regarding the possibility of teeth retention. The study took place from September 5, 2010, to July 29, 2011. For each patient, a special file was completed in order to obtain the required information. Among the data collected were patients' sex and age, the main reason of referral, the type of the tooth, and the main chief complaint.

Each tooth was clinically and radiographically evaluated by 3 examiners (endodontists) who had been previously calibrated mainly for the determination of the clinical status of the teeth. The radiographic evaluation initially took place independently based on the clinical experience of each examiner. Only 1 diagnosis could be

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noted for each examination. If more than 1 factor was documented related to tooth extraction, the more untreatable condition was chosen (eg, vertical root fracture over iatrogenic perforation). Disagreements and different opinions were discussed among the examiners a second time until a consensus was reached. The decision for teeth extraction or retention was made after clinical and radiographic evaluations and a consensus was reached among the 3 examiners regarding the radiographic appearance of the teeth. In the majority of the cases, the clinical evaluation included the isolation of the teeth with a rubber dam, caries removal, access of the pulp chamber, and microscopic examination. An additional parameter (patients' wishes) was taken into account regarding the treatment options (ie, conventional or surgical management or extraction) of the examined teeth.

Clinical conditions related to the extraction of endodontically treated teeth were classified in 12 different categories (ie, vertical root fracture, calcification plus patients' wishes, cervical resorption plus patients' wishes, dental trauma, endoperiodontal lesion, endodontic failure plus patients' wishes, iatrogenic perforation, nonrestorable caries, orthodontic reasons, periodontal disease, prosthetic reasons, and an unrestorable cusp fracture). Additionally, teeth planned for extraction were classified into 8 different categories according to the type of tooth (ie, maxillary incisor, mandibular incisor, maxillary canine, mandibular canine, maxillary premolar, mandibular premolar, maxillary molar, and mandibular molar).

Data were pooled and statistically evaluated by SAS version 9.0 (SAS, Cary, NC). Ninety-five percent confidence intervals (CIs) were calculated with the aim to estimate differences between proportions. The associations between extraction reasons (ie, nonrestorable caries, vertical root fracture, periodontal disease, perforation, and so on) and patients' age and sex or tooth type (eg, maxillary vs mandibular molars and so on) were analyzed using the Pearson chi-square test. The level of statistical significance was set at 95% ($P < .05$).

Results

Of the 275 endodontically treated teeth examined, 217 (79%) were extracted. The remaining 58 (21%) teeth were endodontically retreated, permanently restored, and programmed for recall examination every 6 months for at least 2 years. A questionable clinical status of teeth was the main motive for endodontic referral (57.1%) followed by a high suspicion of the presence of a vertical root fracture (13.8%), iatrogenic perforation (10.9%), endodontic failure (9%), an endoperiodontal lesion (4%), and calcification (2.9%). The remaining 2.2% included other reasons for referral such as dental trauma, periodontal disease, and cervical resorption (Table 1).

The distribution of the extracted teeth is shown in Figure 1. The most commonly extracted teeth were maxillary molars (36.2%) and mandibular molars (32.9%). Other categories of teeth followed with lower percentages such as maxillary premolars (12.7%), mandibular premolars (11.3%), maxillary incisors (2.8%), mandibular incisors (2.8%), mandibular canines (0.9%), and maxillary canines (0.5%).

TABLE 1. Distribution of the Teeth According to the Main Motive for Endodontic Referral

Main motive (N = 275)	n	%
Questionable clinical status	157	57.1
Possible presence of a vertical root fracture	38	13.8
Iatrogenic perforation	30	10.9
Endodontic failure	25	9
Endoperiodontal lesion	11	4
Extensive calcification	8	2.9
Other	6	2.2

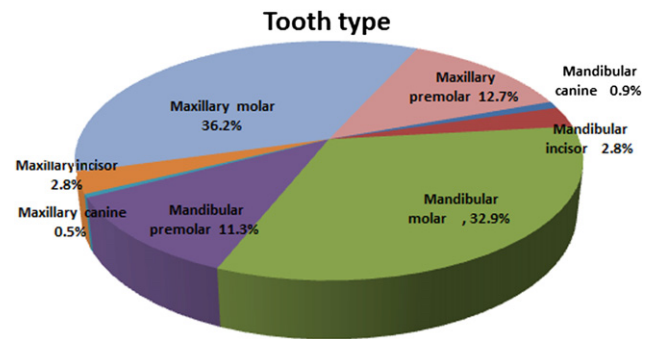


Figure 1. Distribution of the extracted teeth according to tooth type.

The reasons for extraction of the teeth examined are diagrammatically presented in Figure 2. Nonrestorable caries was the most prevalent reason (37.1%; 95% CI, 30.6%–43.6%). Other significant reasons were nonrestorable cusp fracture (17.8%; 95% CI, 12.7%–23%) and the presence of a vertical root fracture (10.3%; 95% CI, 6.2%–14.4%). Other reasons were periodontal disease (8.5%), iatrogenic perforation (6.6%) or the initial presence of a perforation (0.5%), endodontic failure (5.6%), a prosthetic reason (4.2%), an endoperiodontal lesion (2.8%), dental trauma (2.3%), orthodontic reasons (1.9%), calcification (1.4%), and cervical resorption (0.9%).

No significant differences were found among the different group ages ($P = .679$) and sex ($P = .422$) regarding the prevalence of the clinical condition of “nonrestorable caries.” Nonrestorable caries were significantly more prevalent in molars than in premolars ($P < .001$) but without differences between mandibular and maxillary molars. The tendency for a decrease of the clinical condition of “unrestorable cusp fracture” as patients' ages increased ($P = .063$) was also evident.

Of the 58 teeth retained, 28 needed a surgically crown-lengthening procedure. All these teeth were endodontically retreated and restored using either a cast or a prefabricated post. Fifteen teeth were only conventionally retreated and permanently restored with a single crown. Ten teeth were surgically retreated using a microscope and mineral trioxide aggregate (MTA) as retrofilling material. MTA was also used as a repair perforation material in the remaining 5 teeth.

Discussion

The present study was conducted with the aim to investigate more precisely the reasons that determine the decision-making process regarding the retention or extraction of endodontically treated teeth with an uncertain prognosis. This was performed in 2 different ways. First, the procedure was completed using a prospective approach in order to minimize the risks and limitations as a result of the interpretation of retrospective data. Second, the clinical and radiographic evaluations of the teeth were performed by 3 experienced endodontists after patient referral to their private clinic. However, the calibration of clinical examiners remains a major difficulty and is a common limitation in these types of studies (14). Another serious limitation is also that a great number of endodontically treated teeth are probably extracted by general dentists for various reasons without previous referral to endodontists. All these teeth are automatically excluded from a study like this without the appropriate analysis of the extraction reasons.

The main motive for endodontic referral of endodontically treated teeth with an uncertain prognosis was found to be their questionable clinical status. In the majority of cases, caries of the pulp chamber floor were evident during clinical microscopic examination. This finding was considered to be crucial in the decision of retention of the tooth in the

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