



Analysis of reasons for retreatment and extraction of endodontically treated teeth: A transversal study

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ABSTRACT

OBJECTIVE: Was to analyze the reasons related to retreatment and extraction of endodontically treated teeth.

METHODS: Data were collected consecutively during a 12-month period from data of patients who had indication for root canal retreatment or extraction of endodontically treated teeth after an initial visit. The patients were scheduled for a new consultation and the need for root canal retreatment or extraction was confirmed by three previously calibrated examiners. After that, a clinical form was completed, including data about the patient and tooth, presence of apical radiolucency, reasons for root canal retreatment or extraction, and the treatment option. The aforementioned variables related to the patients and the teeth were computed and are given as their absolute value and percentage.

RESULTS: Inadequate filling was the most frequent reason (40.5%) to perform root canal retreatment; non-surgical root canal retreatment was the most frequent treatment option (95%). Failure or fracture on definitive restoration (prosthetic crown) was the most frequent reason (30%) to perform extraction of endodontically treated teeth; tooth extraction with prosthetic rehabilitation was the most frequent treatment option (78%).

CONCLUSION: Inadequate filling and failure or fracture on definitive restoration associated with apical radiolucency should be taken into account during the decision-making process regarding endodontically treated teeth with questionable prognosis.

Key words: Endodontically treated teeth; Retreatment; Extraction

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Análise das razões para retratamento e extração de dentes tratados endodonticamente: um estudo transversal

RESUMO

INTRODUÇÃO: Analisar razões relacionadas com retratamento e extração de dentes tratados endodonticamente.

METODOLOGIA: Os dados foram coletados consecutivamente durante 12 meses a partir de pacientes que tiveram indicação para retratamento ou extração de dentes tratados endodonticamente após uma consulta inicial. Os pacientes foram agendados para uma nova consulta e a necessidade de retratamento ou extração foi confirmada por três examinadores previamente calibrados. Em seguida, um formulário clínico foi preenchido, incluindo informações sobre o paciente e o dente acometido, presença de lesão periapical, razões para retratamento ou extração e a opção de tratamento. As variáveis mencionadas foram computadas e descritas como valor absoluto e percentual.

RESULTADOS: Obturação inadequada foi a razão mais frequente (40.5%) para realizar o retratamento endodôntico; o retratamento convencional não-cirúrgico foi a mais frequente opção de tratamento nesses casos (95%). Falha ou fratura de restaurações definitivas (coroas protéticas) foi a razão mais frequente (30%) para realizar a extração de dentes tratados endodonticamente; a reabilitação protética foi a mais frequente opção de tratamento nesses casos (78%).

CONCLUSÃO: Obturação inadequada e falha ou fratura em restaurações definitivas associadas com lesão periapical devem ser levados em consideração durante o processo de tomada de decisão nos casos de dentes tratados endodonticamente com prognóstico questionável.

Palavras-chave: Dentes tratados endodonticamente; Extração; Retratamento

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INTRODUCTION

The purpose of endodontic therapy is to eliminate microorganisms and organic tissue from the root canal system, creating an environment that will allow for healing of periapical tissues and prevent the development of apical periodontitis. The success rate of root canal treatment has been based on radiographic healing or whether an endodontically treated tooth remains present and functioning in the oral cavity [1]. According to Imura et al. [2], of 1376 teeth treated in an initial endodontic treatment sample, the success rate was 94%. However, despite high success rates and advancements in endodontic therapy, the clinician is usually confronted with a dilemma when examining a patient who has got an endodontically treated tooth with questionable prognosis. This derives from the question of whether to maintain and retreat a tooth that is eventually compromised, or to opt for extraction and replacement with a prosthesis or dental implant.

The recent success of dental implants has resulted in significant changes in oral rehabilitation strategies. Some authors consider dental implant therapy as the most reliable alternative for replacement of teeth with questionable prognosis [3], showing success rates of 94% of cases submitted to this therapy [4]. However, it is important to note that the maintenance of natural dentition with appropriate function and satisfactory esthetics is the main objective of any therapy, since an artificial restoration cannot compete with a natural tooth regarding its physical, biomechanical, and sensory properties [5].

The decision to promote retreatment or extraction of endodontically treated teeth includes the critical and multidisciplinary evaluation of several factors that influence the treatment option. However, the majority of studies in the literature are based on success percentages of each dentistry field, as well as on criteria that contribute to the success of these treatments [6]. The literature does not use a multidisciplinary approach in order to clarify the reasons that lead to a specific treatment option and to help the clinician when faced with an endodontically treated tooth with questionable prognosis.

The purpose of present study was to transversally investigate the reasons for the retreatment and extraction of endodontically treated teeth.

METHODS

This study was approved by the Ethics Commission of the School of Dentistry of University of Passo Fundo (Passo Fundo, RS, Brazil). Data were collected consecutively during a 12-month period from May 2014 to May 2015. The information was obtained from data of patients who had an indication for root canal retreatment or extraction of endodontically treated teeth after an initial visit at the screening sector of the School of Dentistry of University of Passo Fundo.

The patients were scheduled for a new consultation, and the need for root canal retreatment was confirmed by three examiners during the second visit. Firstly, the presence of endodontic treatment was confirmed by the radiographic appearance of the permanent root canal filling, followed by clinical evaluation of the compromised tooth. After that, the three examiners have filled a clinical form that included data about patients who had an indication to perform root canal retreatment. The clinical form included: information about the patient (gender, age, and systemic conditions); reason for consultation (pain, esthetic, mobility, prosthetic reason, or routine visit); the indicated tooth to perform root canal retreatment; presence of periapical lesion in the radiography (yes or no); the reasons for root canal retreatment (endodontic, periodontal, or restorative reasons); and treatment option (non-surgical root canal retreatment or surgical root canal retreatment).

The same procedure was adopted with patients who had an indication for extraction of endodontically treated teeth. The three examiners have filled another clinical form that included: information about the patient (gender, age, and systemic conditions); reason for consultation (pain, esthetic, mobility, prosthetic reason, or routine visit); the indicated tooth to perform extraction; presence of apical radiolucency in the radiography (yes or no); the reasons for tooth extraction (endodontic, periodontal, or restorative reasons); and treatment option (tooth extraction with prosthetic rehabilitation or tooth extraction with dental implant rehabilitation).

The three examiners were previously calibrated using Kappa test to indicate the reasons for root canal retreatment or extraction of endodontically treated teeth. Confidentiality and anonymity were respected throughout. The aforementioned variables are given as their absolute value and the percentage. After completion of clinical forms, the root canal retreatment or extraction of endodontically treated teeth was performed.

RESULTS

The Kappa test has showed good agreement between observers, with values of 0.9 or above.

Root canal retreatment

Two hundred clinical forms were obtained from patients who had an indication to retreat a permanent tooth with previous endodontic treatment during the study period. Of the 200 cases, 144 (72%) were female and 56 (28%) were male, and the most affected age group was between 41 and 50 years (33%). Systemic involvement was present in 116 (58%) cases, and smoker patients represented 17.5% of the sample.

Dental pain was the main reason for consultation (30%), followed by prosthetic reasons (26%), routine visit (23%), and esthetic reasons (21%). The teeth that were the most often involved in the root canal retreatment were the maxillary incisors (24%), followed by maxillary premolars

(20.5%), mandibular molars (15.5%), maxillary molars (15%), mandibular premolars (12.5%), maxillary canines (5.5%), mandibular incisors (4.5%), and mandibular canines (2.5%). Apical radiolucency was present in 88% of cases.

The reasons for which the decisions to retreat a tooth with previous endodontic treatment were made are presented in **Figure 1**. Inadequate filling (spaces between the filling materials) was the most frequent reason (40.5%), and other reasons included: short filling (20.5%); failure or fracture on definitive restoration (prosthetic crown; 12.5%); failure or fracture on provisional restoration (11%); missed canals (8%); failure or fracture on definitive restoration (composite resin or amalgam; 4.5%); overfilling (2%); fractured instrument (0.5%); and root perforation (0.5%). Non-surgical root canal retreatment was performed in 95% of cases, whereas surgical root canal retreatment was performed in 5% of cases.

Tooth extraction

One hundred clinical forms were obtained from patients who had an indication to extract a permanent tooth with

previous endodontic treatment during the study period. Of the 100 cases, 64% were female and 36% were male, and the most affected age group was 51–60 years (26%). Systemic involvement was present in 56% of cases, and patients with hypertension represented 27% of the sample.

Esthetics was the main reason for consultation (43%), followed by pain (20%), routine visit (20%), prosthetic reasons (10%), and mobility (7%). The teeth that were the most often involved in the extraction were the maxillary premolars (21%) and mandibular premolars (21%), followed by maxillary molars (16%), maxillary incisors (15%), mandibular molars (14%), maxillary canines (7%), mandibular incisors (3%), and mandibular canines (3%). Apical radiolucency was present in 90% of cases.

The reasons for which the decisions to extract a tooth with previous endodontic treatment were made are presented in **Figure 2**. Failure or fracture on definitive restoration (prosthetic crown) was the most frequent reason (30%), and other reasons included: periodontal disease (15%); failure or fracture on definitive restoration (composite resin or amalgam; 11%); failure or fracture on provisional

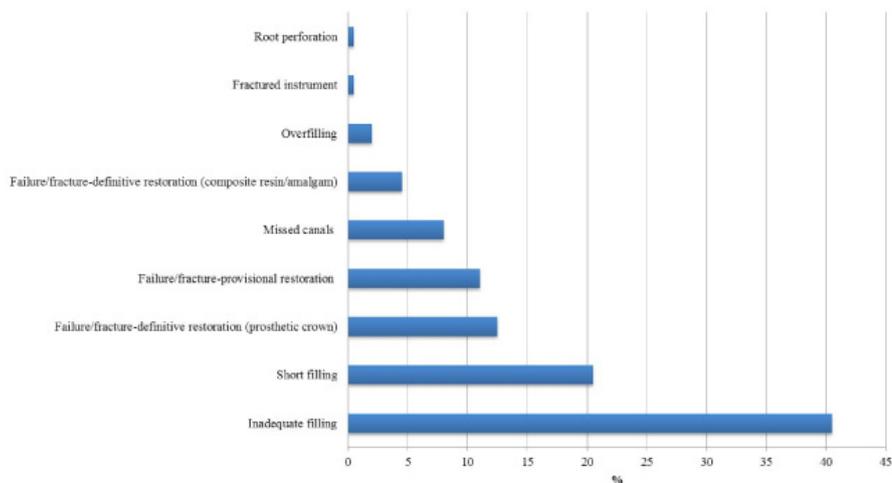


Figure 1. Reasons for retreatment of the 200 endodontically treated teeth.

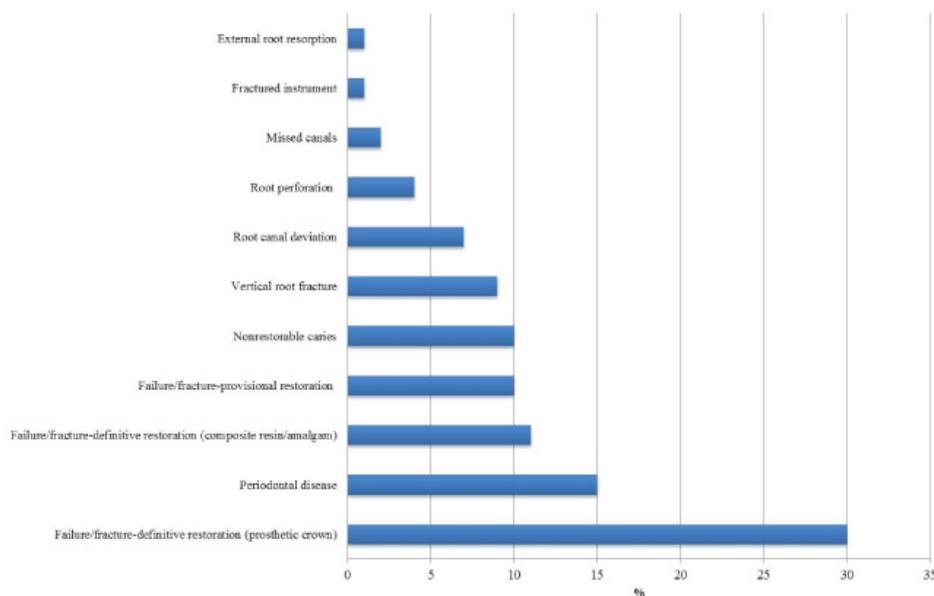


Figure 2. Reasons for extraction of the 100 endodontically treated teeth.

restoration (10%); non-restorable caries (10%); vertical root fracture (9%); root canal deviation (7%); root perforation (4%); missed canals (2%); fractured instrument (1%); and external root resorption (1%). Tooth extraction with prosthetic rehabilitation was performed in 78% of cases, whereas tooth extraction with dental implant rehabilitation was performed in 22% of cases.

DISCUSSION

Despite the presence of high rates of success in endodontic therapy, mainly due to knowledge of internal dental anatomy and advancements in science and technology, failures in root canal treatment have been described [7]. Once diagnosed as a failure of primary endodontic therapy, the tooth may be submitted to a new intervention, which is the usual procedure in endodontics in order to correct the failures of the previous treatment. The clinician will opt for tooth maintenance and retreatment of the root canal system or extraction of endodontically treated tooth. However, whilst single identifiable risks may be easy to manage clinically, the presence of multiple risks appears to jeopardize the decision-making process regarding a tooth with questionable prognosis [8].

According to the results of the present study, an analysis of factors related to gender and age group of patients did not reveal higher values to a specific group of gender or age. These findings are in accordance with previous study, which have demonstrated that failure of endodontic therapy can occur regardless of gender and age [9]. However, a higher age group was observed in the cases of extraction (51-60 years) when compared to cases of retreatment (41-50 years) of endodontically treated teeth. Thus, the persistent maintenance of a weakened tooth for a longer period of time can result in worsening of pathological conditions and decreases the possibilities of maintenance and retreatment of endodontically treated teeth.

The systemic conditions are crucial aspects to be considered when the patient will be submitted to endodontic treatment. In the present study, patients with hypertension represented 27% of cases that were indicated for root canal retreatment and smokers represented 17.5% of patients who were indicated for extraction. According to previous study of Wang et al. [10], the risk of new intervention after non-surgical endodontic treatment is significantly associated with diseases related to coronary arteries, diabetes mellitus, and arterial hypertension. Although et al. the reasons related to periodontal diseases were 5.8 times more important with smokers than with non-smokers [11], Touré et al. [12] have showed that smoking status did not show any differences when compared with reasons for extraction of endodontically treated teeth. Furthermore, the amount of smoke and the total time of consumption by the patient cannot be determined and may influence these divergent results [9].

Dental pain was the main reason related to patients who had an indication to retreat an endodontically treated tooth in the current study. Similar results were observed in a prior

study related to emergencies [13]. The presence of pain is an essential factor in order to establish an adequate diagnosis and treatment option. It could be a sign that there is some pathology affecting the tooth and adjacent tissues, which may be caused by occlusal trauma, root fracture, or progression of a periapical lesion. Thus, endodontically treated teeth that have persistent symptomatology require a new intervention in the root canal system, once these cases can have evidences of failure. On the other hand, esthetics was the main reason related to patients who had an indication to extract an endodontically treated tooth in the current study, which can be explained by some reasons that were found in the present study, such as fracture on definitive restoration retained by prosthetic crown or composite resin/amalgam, fracture on provisional restoration, and non-restorable caries. These conditions damage the coronal portion of teeth at a high level and affect their esthetics, generating demands from patients who require oral rehabilitation procedures that are carried out according to the principles of the current esthetics.

According to the results of the present study, the maxillary incisors had the highest incidence of cases that were indicated for root canal retreatment (24%), followed by maxillary premolars (20.5%), whereas the maxillary premolars (21%) and mandibular premolars (21%) were the most representative group of teeth that were indicated for extraction of endodontically treated teeth. Previous studies have demonstrated unexpected anatomical variables and complexities in maxillary incisors [14], as well as in maxillary and mandibular premolars [15]. Furthermore, the maxillary premolars are more susceptible to vertical root fracture [16]. These conditions can help to explain the higher incidence of failure of endodontic treatment in these teeth. However, the current results are not in agreement with previous studies that found a predominance of mandibular molars indicated for extraction after endodontic therapy, due to their susceptibility to caries and the frequency of treatments [11, 12].

Apical radiolucency was present in 88% of cases that were indicated for retreatment and 90% of cases that were indicated for extraction of endodontically treated teeth. This may be indicative of the presence of microorganisms in the root canal system, and can help the decision-making process about endodontically treated teeth with questionable prognosis. Some bacteria, such as *Enterococcus faecalis*, and their products are the main etiological factor of pulpal and periapical pathologies, and they exert a significant role in the induction and progression of these conditions [17]. *Enterococcus faecalis* is an anaerobic facultative microorganism that is highly resistant to conventional chemomechanical preparation, and it is usually found in cases of failure of root canal treatment [18]. This microorganism has several virulence factors, and is able to withstand prolonged periods of nutrient limitation, thus persisting as a pathogen in the root canal [19]. Its presence contributes to development of periapical lesions, and its association with factors, such as inadequate filling and failure or fracture on definitive restoration, can influence the establishment of

diagnosis and the decision-making process in order to retreat or extract the endodontically treated tooth.

Technical failures, such as inadequate filling, missed canals, and untreated canals, cannot lead to objectives that concern endodontic therapy in order to provide the prevention and control of infection. According to the results of the present study, a significant percentage of cases were diagnosed as inadequate filling of the root canal (40.5%) and short filling (20.5%). Several factors related to endodontic technique can result in the need for a new intervention of endodontically treated teeth, including the ability and knowledge of the professional who performed the primary endodontic treatment. Epidemiological studies have shown a higher percentage of failure [20, 21] when the root canal therapy is performed by general clinicians, when compared to treatments that were performed by specialists, which have a success rate of up to 94% [2]. Moreover, the quality of coronal restorations can also contribute to failure of endodontic therapy [16], which is in accordance with the findings of the present study, where the failure or fracture of coronal restoration retained by composite resin, amalgam, prosthetic crown, or provisional material represented a significant percentage of cases that were indicated for new root canal treatment.

In the present study, failure or fracture on definitive restoration (prosthetic crown) was the main reason for extraction of endodontically treated teeth (30%). These findings are in accordance with the previous study of Fuss et al. [22] who noted coronal leakage in endodontically treated teeth that led to non-restorable caries, and was the main reason for extraction in these cases. It suggests a correlation between restorative treatment and success of endodontic therapy in the maintenance of dental elements in the oral cavity, considering the importance in the prevention of recontamination of the root canal system [16, 23]. Furthermore, the relation between coronal restoration and apical periodontitis has been explored in several retrospective clinical trials, suggesting that failure or fracture on coronal restoration is a factor related to development of this pathology [24]. Another reason to indicate extraction of endodontically treated teeth was periodontal disease, representing 15% of cases in the present study. According to previous studies, periodontal diseases are rarely (5%) a reason for tooth extraction [11, 22]. On the other hand, Touré et al. [12] showed that periodontal diseases were associated with tooth extraction in 40.3% of cases. Regardless of the obtained percentage in different studies, the periodontal conditions must always be considered in the decision-making process involving teeth with questionable prognosis.

The treatment option was also analyzed in the present study. Although surgical root canal retreatment has demonstrated success rates close to 89% [25], non-surgical root canal retreatment represented 95% of choice by patients who were submitted to a new intervention of endodontically treated teeth. Apical surgery was limited to cases of overfilling and a fractured instrument in the apical

portion of the root canal. On the other hand, the extracted endodontically treated teeth were replaced by prostheses (fixed or removable) rather than implants in 78% of cases. Despite the high success rates of 94% of cases submitted to dental implant therapy [4], economic reasons have influenced the decision-making process of patients who looked for a low-cost treatment in the university when compared to costs of a private clinic.

CONCLUSION

Despite some limitation, the present study provides data related to reasons for retreatment and extraction of endodontically treated teeth. The main reason for retreatment was inadequate filling, and the main reason for extraction was failure or fracture on definitive restoration retained by prosthesis associated with apical radiolucency in both cases. These factors should be observed during the decision-making process of teeth with questionable prognosis. Further research with calibrated clinicians in different environments of dental practice would provide additional information.

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