

# Reasons for Extraction of Endodontically Treated Teeth – a Review of Literature

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## Abstract

**Objective:** Despite progress in endodontic techniques and materials, extraction of endodontically treated teeth is still often performed. Understanding of the reasons, leading to extraction, is very important, in order to limit and influence future extractions.

**Aim:** The purpose of this review article is to analyze and systemize the factors, related to extraction of endodontically treated teeth.

**Methods:** A review of related articles and publications was conducted in order to investigate the main reasons for extraction of endodontically treated teeth.

**Results:** The main reasons for the extraction of endodontically treated teeth are non-restorable caries lesions, root fractures and severe periodontal involvement. Endodontic failure, presence or non-healing of apical periodontitis, represent often a small part of total failure.

**Keywords:** extraction, endodontic failure, endodontically treated tooth, factors

## Background

Tooth extraction is dental procedure which should be considered as last option after failed or impossible dental treatment. The number of extracted teeth can serve as indicator of socio-economic and oral hygiene-level (1). A decrease in the number of teeth may result in poor dietary habit and can rapidly impact the quality of life (2).

Extraction of permanent teeth is performed for several reasons incl. dental caries, periodontal disease, orthodontic reasons, impacted teeth, failed dental treatment, prosthetic indications and other reasons (3). Despite progress in prevention and operative techniques, teeth extraction remains an important part of therapeutics (4).

An understanding of the reasons why teeth are extracted is essential. By identifying the main reasons for tooth loss, it may be possible to limit and influence future extractions.

Because endodontic treatment is performed mainly to prevent tooth extraction, it is important to evaluate the fate of endodontically treated teeth (4). Endodontic treatment is predictable treatment, resulting in up to 97% retention rate for the treated teeth. However, about 3% of endodontically treated teeth require further extraction of the tooth (5).

The reasons for extraction of endodontically treated teeth are mainly non-restorable caries lesions, endodontic failure, vertical root fractures, iatrogenic perforations, periodontal disease, non-restorable cusp fractures, orthodontic and prosthetic considerations and dental trauma (5).

Relevant knowledge on the outcome of endodontic therapy is a key to clinical decision making, particularly when endodontic treatment is weighted against tooth extraction and replacement (6).

A review of literature was conducted in order to summarize the main reasons for extraction of endodontically treated teeth and to investigate if the extraction was necessary due to endodontic related reasons such as endodontic failure, iatrogenic perforations or other iatrogenic endodontic mishaps.

## Results and Discussion

Salehrabi et al. (7) and Lozarski et al. (8) investigated the retention of endodontically treated teeth in the oral cavity after a long follow-up period. The authors reported retention of the endodontically treated tooth in 94% and 97% of the cases. These studies have not pointed out the reasons why extraction was needed.

Another study, carried out in Taiwan (9) reported a 92,3% retention rate of endodontically treated teeth in the oral cavity 5 years after performing a non-surgical endodontic treatment. Here again the reasons for the extraction of the teeth were not investigated.

Fuss et al. (10) carried out a study, investigating the reasons for extraction of 147 teeth. The most common reason was a restorative consideration – 44% of the teeth were extracted because of impossible restoration. 21% of the investigated teeth were extracted because of endodontic reasons, endo-restorative reasons- 19% and vertical root fractures – in 11% of the cases.

An older study, conducted in 1991 by Vire (11) reported that 59% of the included in the study endodontically treated teeth were extracted because of prosthetic considerations, 32% - due to periodontal engagement and only 9% - due to failure of the performed endodontic treatment.

In another study Zadik et al (5) reported that the main reason for extraction of endodontically treated teeth were non-restorable caries lesions – 61,4%, endodontic treatment failure – 12,1%, vertical root fractures – 8,8%, iatrogenic perforations and stripping perforations – 8,8%. Other reasons were cusp fractures, orthodontic factors, prosthetic factors and trauma. The authors reported that periodontal disease as a reason for extraction was more prevalent among currently smoking patients than among non-smoking ones. The authors concluded that the majority of endodontically treated teeth were extracted due to non-restorable conditions (caries destruction or fracture of unprotected cusps). Endodontically related reasons (such as vertical root fractures, perforations and endodontic failure) were less common. The authors

compared as well the reasons for extraction of mandibular first molars and those of maxillary first molars and concluded that the only significant difference was a higher prevalence of vertical root fractures in the mandibular first molars than in the maxillary ones.

The postendodontic coronal restoration affects the survival of endodontically treated teeth. It is reported that devitalized teeth with full coronal coverage have a greater survival rate than those without (12).

Toure et al. (4) in their study indicated that periodontal disease is the primary reason for extraction of endodontically treated teeth – 40,3%, which differs highly from the results of other studies (5,10,11).

The prevention and treatment of apical periodontitis is the main purpose of the root canal treatment (13). The development of endodontic operative techniques has significantly contributed to this purpose (14, 15, 16). Nevertheless, extraction is still valid as a treatment option, despite the advances of endodontic materials and techniques (17, 18).

Tzimpoulas et al. (19) conducted a study to investigate more precisely the reasons, which determine the decision regarding the retention or extraction of endodontically treated teeth with an uncertain prognosis. The authors reported that the key factor in the decision to extract or retain endodontically treated tooth is the loss of dental tissues. The conducted study also shows that almost 1 out of 10 endodontically treated teeth with a questionable prognosis is extracted because of the presence of vertical root fracture. Vertical root fractures possess a high rate among the extraction reasons of endodontically treated teeth also according other studies (4, 5, 11, 20) with percentage among 8,8-13,4%. Sjogren et al. (21) reported a significantly higher rate of vertical root fractures as a reason for extraction of endodontically treated teeth.

Tzimpoulas et al. (19) reported that only a small number of teeth were extracted because of endodontic treatment failure – post treatment apical periodontitis, sinus tract and clinical symptoms such as spontaneous pain or pain to percussion. These findings are in total agreement with the findings, provided by other epidemiologic studies (1, 8, 9).

According Tzimpoulas et al. (19) the quality of endodontic treatment and the quality of coronal restoration play a crucial role in the decision making – to retain or to extract an endodontically treated tooth. If the endodontic treatment was evaluated as insufficient, the first option was conventional treatment. If on the other hand the treatment was evaluated as sufficient or a cast post was present, then the first option was periapical surgery. Endodontic surgery is considered as a standard procedure which enhances the survival rate of teeth that cannot be treated orthograde because of inaccessibility to the apical region due to posts, root fractures, separated instruments, calcifications, dens in dente, etc. (22).

The patients' wishes also play an important role in the decision-making process in teeth with extensive calcifications and cervical resorption (19). This parameter is presented as an additional factor, because patients' wishes could not play any role in vertical root fracture-cases, in severely periodontal involved teeth, severe endo-perio lesions, in cases with large iatrogenic perforations or in cases when unrestorability is diagnosed. But on the other hand it could have an impact on the decision-making to retain or extract a tooth with a big periapical lesion (19).

Dental trauma in cases with unrestorable defects such as horizontal midroot fractures can also lead to extraction of endodontically treated teeth. Orthodontic and prosthetic reasons can also lead to tooth extraction even in cases when endodontic retreatment or surgery is possible for endodontically treated teeth with existing periapical lesions, because the orthodontists and prosthodontists often don't wish to risk and include the compromised teeth in their treatment planning (19).

Growing attention has been given to procedures carried out after performing an endodontic treatment and to their impact on the retention of the treated tooth (23). Ray and Trope (24) in their study concluded that the health of the periapical tissues after performing an endodontic treatment depends significantly more on the coronal restoration, than on the quality of the root canal treatment. More recent studies also pointed

out the importance of a good post endodontic coronal restoration on the health of the periradicular tissues (25, 26, 27, 28). The results of another study pointed out that the quality of the root canal obturation plays a crucial role on the outcome of the retreatment (29).

Although the difference in moisture content between endodontically treated and vital teeth is a controversial topic, the access cavity in combination with the loss of one or more marginal ridges of the tooth, leaves it at serious risk (23).

Dietschi et al. (30) stated that the loss of vitality but the performance of a good root canal treatment affected the tooth biomechanically only to a limited extent. The tooth resistance to occlusal forces is reduced in proportion to coronal tissue loss due to either caries lesions or restorative procedures (23). Therefore it is important to provide cuspal coverage as soon as possible after performing of an endodontic treatment (31).

Tooth fracture remains one of the major complications in endodontically treated teeth. The main causes of failure of the retention of endodontically treated teeth are loss of retention of posts, crowns, secondary caries and root fractures (32). Udoe et al. (32) in their study reported a 19,9% prevalence of fractures of endodontically treated teeth. Fractures were more often to be seen in amalgam-restored teeth, which may correlate with the configuration of the access cavity. Access cavities, suitable for amalgam, require mechanical retention, which can lead to sound hard tissue removal (32).

On the contrary Dammaschke et al. (33) in their study concluded that restored with glass-ionomer cement endodontically treated teeth tend to fracture more often than those restored with amalgam or composite. Another study (34) also proved that the fracture rate of endodontically treated teeth restored with amalgam and composite resin did not differ significantly. It is claimed by many authors that resin restorative materials actually increase the strength of the tooth due to a cuspal reinforcement (32). The controversy of the finding can be contributed to the different conditions and teeth involved in the experiments. The results show that the strength of endodontically treated teeth is not only dependable on the material used for the restoration, but also on other factors such as kind of the tooth, the extension of the access cavity and occlusal forces (32).

According to the type of restoration of endodontically treated teeth- direct or indirect, a recent study (35) showed that survival rates against fracture of posterior endodontically treated teeth restored with full-coverage crowns or direct resin composite restorations were not significantly different in the teeth with minimal to moderate loss of tooth structure.

Periodontal health is another important aspect, that has an influence on the long-term prognosis of endodontically treated teeth. Patients' periodontal health, requires attention before and subsequent to non-surgical root canal treatment (36). The authors of the study (36) reported that teeth, diagnosed with mild periodontitis were almost two times more likely to be extracted compared to endodontically treated teeth with healthy periodontium at the time of the conservative root canal treatment. The increased risk of tooth loss was 3,1 for endodontically treated teeth with moderate periodontitis. Skupien et al. (37) in their study also confirmed the importance of healthy periodontal status on the survival of endodontically treated teeth. Periodontal pocket depth was found to be a significant factor in the survival of restored endodontically treated teeth. This could be explained with the higher stress concentration on the increased crown length due to the deeper pocket (38). Systemic diseases can also be considered as factors for the predisposition to early initiation of inflammatory periodontal disease and increased caries risk (39,40,41).

## Conclusion

Tooth prognosis should be taken into account before performing extensive dental treatment. Factors beyond the quality of endodontic treatment play an important role in determination of long-term outcome of the performed treatment. Non-restorable tooth destruction and caries lesions, root fractures and periodontal disease are some of the main reasons for extraction of endodontically treated teeth. On the other hand endodontic failure (non-healing or presence of apical periodontitis) represent often a small part of total failure.

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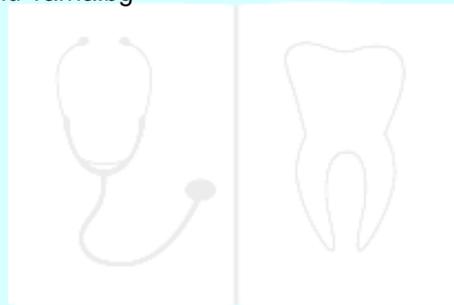
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