# Treatment of Cracked Teeth

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## Abstract

Although many options are proposed for the treatment of cracked posterior teeth, most treatment decisions are not evidence based. Thus, considerable individual variation can occur regarding treatment recommendations for the same scenario. To our knowledge, there are no studies in the literature assessing practitioners' attitudes toward the treatment of cracked teeth. This research recorded variations between general practitioners and specialist groups regarding the treatment approaches of cracked teeth. In a cross-sectional structured questionnaire survey, 32 prosthodontists, 34 endodontists, and 29 general practitioners working in public and private dental health services in Kuwait were assessed regarding their treatment approach to 5 different clinical cracked tooth scenarios. Chosen treatment options varied greatly. Within each scenario, there was a wide range in treatment preferences across all groups and within each group, especially with respect to asymptomatic cracked teeth. Overall, treatment approaches did not relate to specialty training. Statistically significant differences were noticed between endodontists and general practitioners, in case of crowning teeth, in scenario 3 ($P$ = .032), and in extracting teeth for scenario 5 ($P$ = .048). This study highlights that, despite suggested guidelines, there are large differences in the approach to treatment planning for cracked teeth by practitioners and specialists, both as a whole and within each group. Further multicountry studies involving larger dental populations are needed to determine factors that influence practitioners' treatment choices and/or whether better or more widely accepted guidelines need to be established. More prospective well-controlled clinical case-based research with long-term follow-ups is required. *(J Endod 2017;■:1–8)*

## Key Words

Crack, crown, endodontist, extraction, general practitioner, intracoronal restoration, prosthodontist, root canal treatment, treatment

**Significance**

This study highlights large differences in the approach to treatment planning of cracked teeth in many clinical scenarios, both between and within different practitioner groups. Long-term practice-based research is required on which evidence-based treatment decisions can be made.

Cracks in teeth can involve only cusps, or they can involve the whole tooth. When only cusps are involved, the lingual cusps of mandibular molars are the most commonly involved followed in descending order by the buccal cusp of the maxillary premolars and molars and then mandibular premolars (1–4). When the crack involves the whole tooth, the crack often occurs in a mesiodistal direction and passes deeply through the tooth. Although the presence of a crack is often visible on the external surface of the tooth, removal of an existing restoration is required to definitively diagnose the crack (4). Cracks occur when the forces applied to the tooth are greater than the ability of the tooth structure to resist fracture because of an increase in the forces on the teeth or a decrease in their strength caused by restorative procedures performed on them (5).

The age of the patient is a contributing variable, possibly because of the fact that the resistance of human dentin to the growth of a fatigue crack decreases with both age and dehydration (6–8). The type of restoration may also be a contributing factor. A crack may be initiated by a sharp internal line angle associated with nonbonded restorations. Microcracks can form as a result of cuspal flexure caused by occlusal load stress during mastication and repeated thermal expansion of the restorative materials. Resin materials are less susceptible to these changes, and, therefore, fracture frequency is thought to be relatively lower in resin-filled teeth because occlusal stress is distributed through the bonding process (5, 9, 10).

Patients with cracked teeth may present with a wide range of symptoms ranging from occasional discomfort to severe and prolonged pain. Patients often complain of a history of pain of variable intensity that may be difficult to locate. The clinical symptoms of incomplete fractures in posterior teeth were first described by Gibbs in 1954, who coined the phrase "cuspal fracture odontalgia." The variability of the signs and symptoms contributes to the difficulty in diagnosis and treatment planning. At least 26 classifications have been proposed. In 1 of these, the American Association of Endodontists, in a document titled "Cracking the Cracked Tooth Code," identified 5 types of cracks in teeth (ie, craze lines in enamel, fractured cusps, cracked tooth, split tooth, and vertical root fracture) (1, 11, 12) and proposed treatment options for each based on a number of considerations. This includes the recognition of the predisposing factors; understanding the nature of the signs and symptoms; and, most importantly, early diagnosis, especially in cases of incomplete fractures in order to prevent unwanted complications. Symptoms depend on the depth and direction of the crack and the tissues involved (1, 9, 12). The most consistent

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complaint is pain on biting often associated with sensitivity to cold stimuli. Pain upon loading the cusp may be explained by dentinal fluid flow caused by movement between fracture sites (13). If the crack causes pulpal involvement, symptoms of pulpitis will result (9). The loss of pulp vitality may affect the prognosis of cracked teeth; however, according to Tan et al (14), endodontically treated cracked teeth still show a survival rate of only 85.5% after 2 years.

With early diagnosis and appropriate treatment, most cracked teeth can be managed (15–17). However, although a variety of suggested treatment protocols exist, there are no clear-cut evidence-based guidelines on the management of these teeth that take into consideration the many variables that can be present, including the position of the crack and the state of the pulp (4, 18, 19). A search of the literature has also revealed that, although different treatment strategies have been suggested, there is still little evidence-based data available regarding the prognosis for cracked teeth using different treatment protocols (12, 16, 18). Therefore, it could be surmised that treatment planning may vary between dentists, different specialist groups, and even from country to country depending on an individual's training and experience. To our knowledge, there are no published data assessing the attitudes of dentists and specialists toward the treatment of cracked teeth. Thus, the diversity of opinions regarding treatment preferences is not known. It was considered that, only by first identifying inconsistencies in treatment planning protocols between groups, could an understanding for the need for future research be established.

Therefore, the specific objective of this study was to document any differences in the treatment approach of dental practitioners toward different cracked teeth scenarios. Treatment planning for vertical root fractures was not assessed. Three groups of practitioners (prosthodontists, endodontists, and general practitioners) were chosen for investigation. Prosthodontists and endodontists were specifically chosen because it was considered that these individuals would commonly be involved in treatment planning for cracked teeth. The study was based on an unproven assumption that, because of differences in training programs, there would be differences in the approach to the treatment of cracked teeth among each of these specialty groups and among them and general practitioners.

## Materials and Methods

### Study Design and Participants

This cross-sectional study was designed to assess whether there were differences in the treatment approach of dental practitioners toward different scenarios involving cracked teeth. The target population was general dentists, prosthodontists, and endodontists working in a single city. Thirty-two prosthodontists, 34 endodontists, and 29 general practitioners working in public and private dental health services in Kuwait were assessed regarding their treatment approach to 5 different clinical cracked tooth scenarios.

Five different possible clinical scenarios involving descriptions of cracked teeth were assessed. Participants were provided with a history, a clinical photograph, and a radiograph and provided with a standard list of treatment options from which to choose. The scenarios tested were as follows:

1. There was a vertical crack in a premolar tooth. No separation of the segments was noted. The patient was asymptomatic. The tooth was vital and minimally restored, and there was no evidence of periapical radiographic changes.
2. A vertical crack was evident in a premolar tooth without separation of the segments. The pulp was diagnosed as irreversible pulpitis. The tooth was reported to be sore to bite on, and there was no radiographic evidence of periapical radiographic changes.
3. A vital asymptomatic molar tooth in which the tooth was cracked across most of the pulpal floor without separation of the segments; there was no evidence of periapical radiographic changes.
4. An unrestored maxillary premolar tooth was reported to be tender on biting. The tooth was cracked, and separation of the fragments was apparent. Swelling was present in the buccal sulcus.
5. A vital asymptomatic molar tooth with a cracked mesiobuccal cusp and an occlusodistal amalgam restoration; there was evidence of periapical radiographic changes.

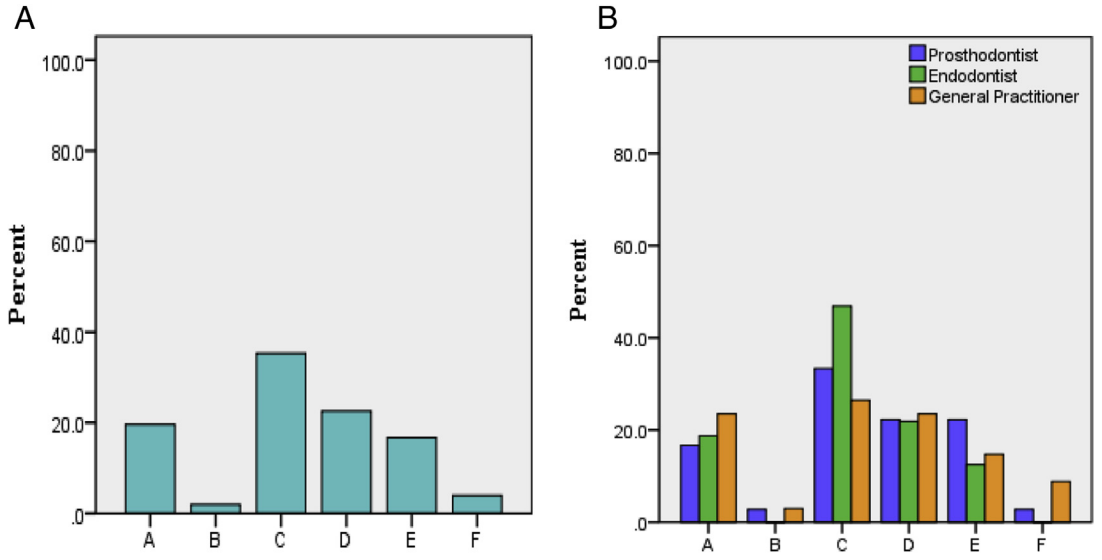


**Figure 1.** Treatment options chosen in scenario 1. (*A*) A combined representation of the treatment options. (*B*) A breakdown of the responses. The largest group of participants (35.3%) preferred the placement of an indirect restoration. More endodontists (46.9%) favored this treatment option than prosthodontists or general practitioners. Root canal treatment and crowning the tooth was an option chosen by 22.6%, whereas 19.6% of the participants choose monitoring the tooth as an option. A, no treatment; B, direct restoration; C, indirect restoration; D, root canal treatment and crown; E, extract; F, others.