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Clinical and Morphological Aspects of Cracks on The Back Teeth in Adults

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Abstract. According to statistics, cracks in teeth are found in 90% of the adult population. In 60% of cases, these are single injuries, in 40% of cases – multiple. In young people aged 20, an average of 4 teeth are damaged, but by the age of 30 their number has tripled..

Keywords. Tooth crack, Prevalence, Distribution, Adult, Back tooth

There were problems with the identification, diagnosis and treatment of cracked teeth. This has made them a research problem in the literature. The American Association of Endodontists [2] has defined a tooth fracture as a type of incomplete longitudinal fracture of the tooth, usually affecting premolars and molars. The fracture plane usually begins at the crown of the tooth and progresses apically with or without symptoms, depending on the degree of fracture [2]. Other longitudinal fractures described by this association include a deformed tooth, a point fracture, a vertical root fracture, and a split tooth. Besides a deformed tooth, others may be the result of an untreated crack on the tooth. Some authors [3] [4] [5] also use the term “cracked tooth syndrome” to describe this type of longitudinal tooth fracture with accompanying signs and symptoms. Gertsen [5] reported in 2003 that the prevalence of cracked teeth has been increasing over the past decade. In addition, it has recently been reported that chips, cracks or fractures are the third most common cause of tooth loss in industrialized countries [3]. This, combined with differences in different population groups and increasing frequency, shows that this is of great clinical importance. Bader et al. [6] reported that in longitudinal fractures of teeth, such as a cracked tooth, a fracture of the tip, a vertical fracture of the root and a split tooth, the incidence of fractures of the posterior teeth was 4.4 per 100 adults per year, with 15% of such fractures resulting in pulp involvement or removal. They also reported corresponding rates for molars and premolar teeth - 3.1 and 1.3 teeth per 100 adults, respectively, of the total number of fractures observed on the posterior teeth. Cracks on teeth usually occur in patients between the ages of 30 and 50 years [7] [8] [9]. The predominance of representatives of either sex was reported [10] [11], while others reported the absence of sexual dependence [12] [13]. Most studies [10] [11] [14] have reported that cracks on teeth are most common on the molars of the mandible with intracoronal restorations. As for the direction of the crack lines, most cracks usually run in the mesiodistal direction; however, they can run in the buccal-lingual direction or as a combination of both [9] [12]. The crack lines are mainly located in the center [11] [15]. Centrally located cracks and cracks running in the mesiodistal direction are more likely to cause pulp involvement, while cracks located on the periphery more often lead to fracture of the spinous tooth [9]. Cracks on teeth tend to occur in these areas because these are weak areas of the tooth where the fracture plane is likely to spread [3].

Differences in reported prevalence can be influenced not only by population characteristics, but also, importantly, by the difficulty of detecting cracks, especially on asymptomatic teeth. Cracks on teeth may or may not be symptomatic. In the presence of symptoms, they are nonspecific and mimic

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inflammation of the pulp, periapical zone or periodontium. Identifying an unbiased crack line is a difficult task in clinical practice [2] [3] [10], especially with asymptomatic cracks on the teeth. If there are symptoms, the doctor usually tries to determine the cause of the pain, and the presence of cracks eventually becomes apparent. However, the detection of cracks in the teeth in the absence of symptoms presents another problem. The doctor, of course, may not look for cracks during routine oral examinations, and people usually do not go to the clinic because of cracks in teeth without symptoms. Consequently, they can be discovered by accident when patients come forward with other complaints. Such accidental finds would be more likely if they were visible to the naked eye. Otherwise, they would have gone unnoticed and continued to spread as a result of chewing or certain parafunctional habits. However, when using other diagnostic tools, more cracks can be detected. In the absence of symptoms, additional remedies such as dyes, X-rays and magnification become necessary. Therefore, studying the prevalence of cracked teeth will require the use of one or more of these additional methods to prevent underestimation of the problem. Research has been conducted [11], dedicated to the prevalence of cracks in teeth.

Materials and methods. A cross-sectional study was conducted for one year of all patients aged 18 years and older who applied to the dental diagnostics and restoration clinics of the teaching hospital. Adult patients with good general health were consistently examined, regardless of the main reason for their visit to the institution, after explaining the results of the study and their consent to participate. An intraoral examination was performed using a sterile dental probe and a mirror to identify the presence of a clinically visible crack on the back tooth or teeth. The diagnostic criteria for a crack on a tooth were: a posterior tooth with an identifiable crack or fracture line running in the mesiodistal or buccolingual direction or in both directions; a crack line indistinguishable with a dental probe; and a tooth can be either symptomatic or asymptomatic. Additional tools such as a magnifying lens, translucency and staining were used to facilitate the identification of a crack on the tooth. Initially, each back tooth was examined for cracks with the naked eye without any additional devices. Then a magnifying lens with a 3.5 X magnification lens (14 diopters) was used (SE, Japan). Subsequently, an X-ray was performed using a Microlux transilluminator (Microlux diagnostic system) to properly lighten the tooth surface. A transilluminator was also placed opposite the buccal part of the tooth, while a dental mirror placed on the lingual side was checked to see if light was passing through the tooth or not. Methylene blue was used on teeth that had symptoms, but no visible crack lines were found. The teeth were stained for a minute and then rinsed to assess whether the dye remained on the suspected crack lines. For each crack on the posterior tooth detected with the naked eye or with the help of auxiliary means, a dental probe was carefully conducted along the crack to exclude a split tooth. After confirmation, patients who had at least one cracked back tooth were included in the study. Anterior teeth with cracks and other longitudinal fractures, such as craze lines, fracture of sharp protrusions, vertical root fracture and split tooth, were excluded from the study. All data related to the study, including the characteristics of the subjects, were collected in the form of data, including age, gender, occupation, education, affected tooth, number of affected teeth and distribution.

Discussion. Cracks on teeth can occur with or without symptoms, and their localization, even in the presence of pulp symptoms, can be difficult to determine. Problems have been associated with the identification of cracks on teeth, since the detection of cracks may require careful assessment [2]. Seo [19] reported on the importance of using various diagnostic tools and aids to identify cracks in teeth. In this study, the detection of cracks in teeth was improved by using various diagnostic tests to avoid

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missing less noticeable cracks, a factor that may underestimate the prevalence. The X-ray was the most useful, considering almost half of the cracks found on the teeth. In addition to the subtle nature of the cracks, which required the use of this auxiliary tool, another reason may be related to the usual mesio-distal direction of most cracks [13], which was also observed in this study, which makes translucency a good tool for its detection. A ray of light directed at the buccal or lingual surface of the tooth may not completely pass to the other side of the tooth, indicating a longitudinal fracture of the tooth with a crack line in the mesiodistal direction. The usefulness of this method has also been confirmed in this study. In addition, cracks located in the center were easily detected compared to cracks located on the periphery, which required more translucency to detect them. This may be due to the usual complaint of pain in teeth with centrally located cracks after pulp damage, which forces the doctor to look for cracks in such teeth. In addition, cracks located along the periphery, such as cracks running in the mesiodistal direction, can be difficult to detect due to the location of adjacent teeth. Staining was the least useful method of detecting cracks in teeth in this study. This is probably due to the fact that in order to detect cracks using staining, it is required that the stain be in close contact with the tooth for two to three days. Since detection does not occur immediately, this makes it possible to use other methods such as X-ray, wider use and, consequently, a higher crack detection rate. However, it is a useful tool when it comes to identifying crack lines. It has been demonstrated that cracks in teeth affect molars more than other types of teeth [11] [13] [16] [19]. A similar trend was observed in this study. Ehrmann and Tjas [26] suggested that the reason is the proximity of the molars to the temporomandibular joint. Arnold [28] reported that most of the posterior teeth are affected by stronger forces with a 4:2:1 force ratio on the molars, premolars and incisors, respectively. This study also showed that the first molar of the mandible is the most affected type of teeth, as reported in previous studies [14][29]. This is not surprising, because this is the first tooth that erupts. It lasts longer and is subjected to a greater occlusal load compared to other back teeth. In addition, they may be more susceptible to caries, chewing disorders, repeated restorations and wear of occlusal surfaces.

Thus, it can be stated that the synergistic effect of these factors on the first molar of the mandible predisposes to the appearance of more cracks. On the contrary, other studies [10][11] have reported that the second molar of the mandible is the most common cracked tooth.

Conclusion. Most of the cracks were found on the mandibular molars, and the first molar of the mandible was the most frequently cracked tooth. X-ray is a quick and easy way to improve the detection of cracks in teeth, but a combination of other methods provides a better assessment.

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