MULTIPLE CROWN FRACTURES OF PERMANENT MOLARS: AN UNCOMMON CASE OF INDIRECT TRAUMA

ABSTRACT

The incidence of crown fractures of posterior teeth due to traumatic injuries is very low contrary to higher rate seen with anterior teeth. Diagnosis of posterior tooth fractures can be difficult. Cracks, fractures, and loss of tooth structure may only be detected later when complaints started. Yet if diagnosed correctly, with the advancements in treatment methodologies, in adhesive dentistry the remaining tooth structure can be reinforced to provide functional ability. This case report presents the delayed diagnosis of a bilateral uncomplicated crown fracture of a 13-year-old boy affecting maxillary (#16, #26) and mandibular first permanent molars (#36, #46) due to indirect trauma and their treatments: composite resin restorations for teeth #16, #36, #46, partial pulpotomy for tooth #26 and final restoration with a stainless steel crowns.

Keywords: Indirect Trauma, Multiple Crown Fracture, Permanent Molars
DAİMİ MOLAR DİŞLERDE ÇOKLU KRON KIRIKLARI: NADİR GÖRÜLEN BİR İNDİREKT TRAVMA VAKASI

ÖZ

Travmatik yaralanmalara bağlı posterior dış kron kırıkları ön dişlere oranla daha nadir görülmektedir. Posterior dış kırıklarının tanısı zordur ve ancak çatlak, kırık yada diş yapısının kaybı gibi şikayetler başladıguna saptanabilmektedir. Tedavide, adeziv tekniklerindeki gelişmeler sayesinde kalan diş yapısı güçlendirilmekte ve fonksiyonel etkinlik sağlanabilmektedir. Bu olgu raporu, 13 yaşındaki erkek hastada indirekt travma nedeni ile oluşan maksiler (#16, #26) ve mandibular (#36, #46) daimi 1. molarların bilateral komplike olmayan kron kırıkların geçikmiş tanısı ve #16, #36, #46’ya kompozit rezin ile #26’ya parsiyel pulpotomi ve paslanmaz çelik kron ile yapılan tedavi sonuçlarını anlatmaktadır.

Anahtar Kelimeler: Indirek Travma, Çoklu Kron Kırığı, Daimi Molarlar
INTRODUCTION
The severity and type of the traumatic injuries depend on the configuration, resilience, intensity and direction of the force. Forces that cause fracture of tooth crowns may act on the teeth directly or indirectly. Direct trauma occurs by hitting with rigid objects to tooth surface. Nevertheless, indirect trauma occurs indirectly by transferring force from the jaw to the teeth. The sudden force to the mandibular teeth and their maxillary opponents results with fractures of posterior teeth and the mandibular condyle. In children and adolescents, the most common type of traumatic injuries observed in the permanent dentition is crown fractures with 26-76% prevalence. The study of De Carvalho Rocha and Cardoso concluded that enamel/dentin crown fractures represented 51.4% of the total traumatized teeth in the permanent dentition, mostly affecting maxillary central incisors in patients between 8 and 9 years of age. However, unlike anterior teeth fractures, crown fractures of posterior teeth due to acute trauma is an uncommon type of injury. The etiology of posterior teeth fractures is not well recognized except in cases of accidental trauma. Mostly occlusal trauma, and episodes of bruxism are defined as reasons but Eakle identified restorations as a major predisposing factor for posterior tooth fractures in their adult study where mandibular first molar teeth particularly affected. Clinical studies showed that more fractures occur in permanent molars with large restorations and endodontically treated teeth. Fennis et al. stated that complete cusp fracture is a common phenomenon in dental practice and tooth type and restorative status of the tooth may cause differences in cusp fracture. However the diagnosis of the posterior tooth fractures can be difficult as cracks, fractures, and loss of tooth structure may only be detected later when complaints started. Recently, the role of late referral on prognosis of crown related fractures are being discussed. It is revealed that even incomplete crown fractures of teeth with open apices may result in inflammation because of late referral. So, recognition of signs and symptoms for the management of posterior teeth trauma has great importance on prognosis.

This case report describes the diagnosis and management of the multiple crown fractures of permanent molars of a young child suffered by indirect trauma and 18-month postoperative follow-up.

CASE REPORT
This case report presents a 13-year-old boy who had uncomplicated crown fractures of maxillary permanent first molars #16, #26 and mandibular permanent first molars #36, #46. A sudden strong closure of the teeth was occurred when the patient hit his chin on hard ground after a bicycle fall. The patient didn’t seek treatment after trauma. The patient was referred to Gazi University Faculty of Dentistry, Pediatric Dentistry Clinic 7 months after trauma. There was no sensitivity at the temporomandibular joint and no mandibular deviation during opening or closing of the mouth. Also there was no sign of facial swelling in extraoral examination. There was no pain caused by any periodontal or pulpal diseas. Intraoral examination revealed that all first molars had uncomplicated crown fractures (Figure 1A and B). Panoramic radiograph showed indirect crown fractures without pulpal involvement and there was not any fracture line in either maxillary or mandibular bone segments (Figure 2). The tooth #46 had periapical pathology without any clinical symptoms. Furthermore, the vitality of teeth are examined by the electrical pulp testing (Digitest, Parkell, USA) and all teeth responded within normal limits. Types of fractures are classified as Type II Fracture, Div 1, A and Type III Fracture, Div 2, A according to Loomba et al. (Figure 3). Therefore it was decided to restore the teeth with composite resin restorations. Coronal tooth restorations of #16, #26, #36 and #46 was performed using a self etch adhesive system (Clearfil SE Bond, Kuraray, Japan) and a composite resin (Clearfil Majesty, Kuraray, Okuyama, Japan). Unfortunately, the patient referred to our clinic with occlusal trauma 2 weeks after the restorations, with loss of restoration #26. It was observed that there was a almost 5 mm pulp exposure. The tooth was asymptomatic hence it was decided to perform partial pulpotomy for tooth #26. After local anesthesia and rubber dam isolation, cavity was prepared with a sterile diamond round bur (#012). Bleeding was controlled with moist cotton pellets and Mineral Trioxide Aggeragate (MTA) (Pro-Root MTA, Dentsplay, Germany) was applied. Cavity lining was formed with glass ionomer cement (Cavitron Plus, Spofo Dental, Czech Republic) and a prefabricated stainless steel crown (3M ESPE, USA) was performed (Figure 4). Then patient was motivated for oral hygiene including dental floss use. Clinical and radiographic examinations at 3 and 12 months showed good esthetics and periodontal health. Throughout 18-months of follow-up process, there
were no symptoms (Figures 5A, B-6). At 24 months follow-up, because the tooth #46 showed clinical symptoms root canal treatment was performed (Figure 7).

DISCUSSION
Coronal fractures of posterior teeth usually occur due to occlusal trauma resulting because of excessive occlusal force on large restorations or with endodontically treated teeth. However, posterior crown fractures as a sequelae of acute trauma might be overlooked, especially if dental care is not sought immediately. Therefore, regardless of the type of trauma, detailed history of trauma should be obtained and documented. Important information such as the time,
MULTIPLE CROWN FRACTURES OF PERMANENT MOLARS

Impact on the chin and indirect trauma to posterior teeth as a result of bicycle accident is a common case which might cause a subcondylar fracture of the mandible. Also the mandibular condyle fractures in some children can be seen with relatively little force, with almost no pain. Thus, the fractures of the mandibular condyle at an early age are easily overlooked. Fortunately, there was no luxation injury history and no bone fractures were detected at radiographic examination. There were fractures in posterior molars both in horizontal plane involving only one cusp and in vertical plane passing buccolingually through the crown. Prognosis of uncomplicated crown fractures depends primarily on the degree of periodontal ligament destruction and the size of the exposed dentin surface. Although the risk of pulp vitality increases due to the dimension of the dental tissue loss, pulp prognosis will be good following traumatic crown fractures if handled properly. Robertson et al. investigated pulp healing responses following crown fracture with or without pulp exposure as well as with and without luxation injury and in relation to the stage of root development. They stated that the stage of root development played an important role for the risk of pulp necrosis after crown fracture. The crown fractures with/without pulp exposure and no concomitant luxation injury showed 99% pulp survival rate and 1% pulp canal obliteration rate. Moreover, crown fractures with concomitant luxation showed pulp survival in 70%. In this case report

Figure 5. Intraoral view in (A) maxilla and (B) mandible, after 18 month follow-up

Figure 6. Radiograph view after 18 months follow-up

Figure 7. Radiograph view after 24 months follow-up in #46
although there was a late referral about 7 months, closed apices and limited loss of tooth structure supported the survival of the teeth. Loomba et al.\textsuperscript{15} determined that a comprehensive classification of tooth injuries was an aid to correct diagnosis and treatment planning. According to their proposal they classified the fractures of anterior teeth in the horizontal or transverse plane as Type I, fractures of the posterior teeth in the horizontal or transverse plane as Type II, fractures of teeth in the vertical or longitudinal plane as Type III and oblique fractures involving the crown, root or both in anterior or posterior teeth as Type IV with some subgroups. Eakle et al.\textsuperscript{8} concluded that the lingual cusps of mandibular molars fractured more often than the buccal cusps while in maxillary molars, buccal and lingual cusps fractured with almost equal frequency. The case was classified as Type II Division 1 A because of having cusp fractures buccally in #16 and lingually in #36 and #46; whereas also Type III Division 2 A classification was determined for the same case due to #26 had buccolingually line fractures in the crown. Although there were optional treatment alternatives such as cast inlay/onlay, direct and indirect composite, CAD-CAM generated porcelain restorations, besides reattachment with tooth fragment, it is preferred to restore the teeth with a total etch adhesive system and a posterior composite resin in this case.\textsuperscript{6,15} Socioeconomic status besides the young age of the patient had a role on this choice. Nevertheless, the restoration of #26 was lost because of occlusal trauma with a slight pulpal exposure after 2 weeks. Therefore, partial pulpotomy with MTA was performed. MTA is preferred because it is a biocompatible material with characteristics of preventing microleakage and stimulating the regeneration of tissue in direct contact.\textsuperscript{20} Patel and Burke\textsuperscript{9} considered that the placement of cuspal coverage restorations may be favorable preventative solution for fractured posterior teeth. Also, it has been shown that the usage of stainless steel crowns instead of composite resin restorations for teeth with partial pulpotomies performed with MTA is long-lasting due to the shorter marginal edges of those teeth.\textsuperscript{21} In our case, based on these results, tooth #26 was restored with stainless steel crown. This case was followed through 3 to 12 months according to Guidelines for the Management of Traumatic Dental Injuries.\textsuperscript{22} 18 months follow-up showed favorable clinical and radiographical results. At the 24 months follow-up, the tooth #46 required root-canal treatment.

**CONCLUSION**

Recognition of signs and symptoms for the management of posterior teeth trauma has great importance on prognosis. Regardless of the type of trauma, a detailed patient history should be obtained and possibility of an indirect trauma should be considered. This case shows the importance of a complete examination of all posterior teeth and considering the possibility of an indirect trauma even in late trauma histories.

**REFERENCES**


