

Fractured Roots

Repair of untreated horizontal root fracture: a case report.

Dent Traumatol. 2003 Oct;19(5):296-7.

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We report a clinical case of horizontal root fracture in the mandibular first premolar induced by a traffic accident. The fractured tooth spontaneously healed and diagnosed radiographically after 2 years. Fractured fragments were separated by a narrow radiolucent line and the edges were rounded, and healing of the tooth is likely to be related to interproximal connective tissue healing. Our case is an example of **spontaneously healed fracture roots**. An interesting finding is that the healing was observed even in the presence of two root canals, the vitality of the pulp was preserved and displacement of fragments were prevented.

Dent Traumatol. 2003 Feb;19(1):52-4.

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An investigation of root-fractured permanent incisor teeth in children.

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- The aim of this retrospective study was to determine the type of healing which occurred in root-fractured permanent incisor teeth in children. The objectives were to determine whether gender, age, stage of root development or location of the fracture affected the healing type. The method involved careful scrutiny of clinical records and radiographs of children who attended a unit of paediatric dentistry in a dental hospital. Relevant information was entered onto a data collection sheet. The results were tabulated and analysed by the chi²-tests using the SPSS statistical package. The results are based on 34 root-fractured teeth in 33 children aged 8-15 years. Root development was incomplete in 27 of the root-fractured teeth and complete in seven teeth. A good healing outcome was seen in 27 (79.4%) of the teeth and poor healing in 7 (20.6%). The only factor which was found to be statistically significantly related to healing was the stage of root

development. It can be concluded that **root-fractured teeth with immature roots have a better chance of showing good healing than teeth with mature roots.**

Endod Dent Traumatol. 1995 Dec;11(6):294-6.

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Traumatic crown fractures in permanent incisors with immature roots: a follow-up study.

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A follow-up study of crown fractured permanent incisors with incomplete root formation was carried out in a group of patients, aged 6-12 years, over a 5-year period in the Dental Clinic of the University of Verona, Italy. The number of injured patients was 55, representing 84 injured incisors. All patients were followed clinically and radiographically using a standardized follow-up protocol. The most common type of trauma was fracture of enamel and dentine without pulpal exposure (80%) and the most common type of treatment was restoration with the acid-etch composite resin technique (46%). Bonding of the crown fragment was performed in 10 instances (12%). At the 5-year-control all teeth with fracture of the enamel had no pulp complications. Four of 67 teeth (6%) with fracture of the enamel and dentine without pulpal involvement showed pulp necrosis and 1 tooth showed pulp obliteration (1.5%). Eight of 14 teeth (57%) with fractures of the enamel and dentine with pulp involvement showed pulp necrosis. Aesthetically 36 of the restored teeth were deemed satisfactory (43%). In 9 teeth the bonded fragment had to be rebonded. 14 teeth were considered unsatisfactorily restored due to wear of the composite (17%). 34 restored teeth had to be retreated because of a new trauma (40%). In one tooth a previous bonded fragment had to be rebonded. These results confirmed that crown fractures without pulp involvement in permanent incisors with incomplete root formation have a low percentage of pulp complications, while 60% of the teeth with crown fractures with pulp involvement had pulp complications.

J Oral Rehabil. 1993 Jan;20(1):89-95.

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Impact fracture characteristics of intact and crowned human central incisors.

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Dynamic fracture energies and patterns of fracture in extracted human central incisors were determined for groups of intact controls, groups with Vita Dur N

crowns, Vita Hi Ceram crowns, Dicor crowns and porcelain veneers. Teeth were struck on their middle labial surfaces by a pendulum impact device. The mean fracture energy for teeth with Dicor crowns was significantly lower than for all other groups ($P < 0.05$). Control tooth crowns fractured obliquely in an apical-direction. Vita Dur N and Dicor crowns shattered, the underlying tooth usually fracturing in the plane of the impact force. Vita Hi Ceram crowns chipped at the site of impact and some fractures were located in the roots. Gold crowns remained cemented and fracture occurred at the crown/root junction, or in the root. Porcelain veneers fractured at the site of impact but remained cemented. Dicor crowns were less fracture resistant than other restoration types tested. Porcelain veneers and full gold crowns stiffened teeth which led to more root fractures than the porcelain crowns.

HORIZONTAL FRACTURE MATERIAL

Quintessence Int. 2004 Sep;35(8):601-4.

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Reattachment of a fractured maxillary tooth: a case report.

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A 14-year-old male patient reported with a horizontal fracture of almost the entire crown of a maxillary incisor, extending subgingivally at the palatal side. After root canal therapy and electrosurgery, the tooth fragment was reattached using a total-etch dentin-bonding system and a hybrid composite. Due to enamel cracks and the necessity for more retention, the labial surfaces of the teeth were veneered with a micro-filled composite. The clinical situation of the reattached teeth was confirmed successful by radiographic and photographic assessment after 1, 3, 6, and 12 months. The restoration of an anterior tooth with original tooth fragment in young patients has advantages over conventional composite or prosthetic restorations. However, reattached teeth with fracture extending subgingivally, require long-term follow-up.

Dent Traumatol. 2002 Apr;18(2):98-102.

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Repair characteristics of horizontal root fracture: a case report.

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Radicular fractures in permanent teeth are uncommon injuries among dental traumas, comprising 0.5-7% of the cases. Fracture occurs most often in the middle-third of the root and rarely at the apical-third. The present paper reports a clinical case of a horizontal radicular fracture located between the middle- and apical-third of an upper left-central incisor followed-up for over 3 years. The tooth was extracted owing to periodontal reasons. Histomorphologically, it showed **pulp-vitality preservation and root healing by hard-tissue deposition**.

Pediatr Dent. 2002 Mar-Apr;24(2):98-102.

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Outcomes for root-fractured permanent incisors: a retrospective study.

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PURPOSE: The objective of this study was to assess the outcomes for treated root-fractured permanent incisors with respect to pulp vitality, root tissue union, and tooth survival and to examine the effects of clinical and radiographic parameters and rigid splinting on the outcome. **METHODS:** Eighty-four teeth were identified and data extracted from case notes prior to transfer to an SPSS data base for analysis. The odds ratios for each factor were calculated and the significance of differences was determined. Tooth loss and relevant risk variables were examined using Cox's regression model and Kaplan-Meier survival curves. **RESULTS:** Fourteen (17%) had fractures in the apical third, 47 (56%) in the middle third, and 23 (27%) in the coronal (gingival) third. Twenty-four (29%) also had crown fractures involving enamel and dentine. Crown fractures were identified as significant risk factors for pulp vitality. Loss of pulp vitality, horizontal displacement, and extrusive displacement of the coronal fragment were significant risk factors for hard root tissue union. Survival was poorest with gingival third fractures with 14 (61%) of these teeth being lost. Splinting rigidly had no significant effect on pulp vitality and type of root tissue healing.

CONCLUSIONS: Loss of pulp vitality was significantly associated with enamel-dentine crown fracture. Hard root tissue union was significantly affected by pulp necrosis and luxation of the coronal fragment. Survival was poorest for root fractures within the gingival third of the root. Splinting with rigid fixation had no significant effect on pulp vitality and type of root tissue union.

Dent Traumatol. 2001 Oct;17(5):240-3.

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Repair of untreated horizontal root fractures: two case reports.

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Intra-alveolar root fractures of incisor teeth are more frequent than other dental injuries. These case reports describe two untreated horizontal root fractures of the maxillary right central incisors. Patients reported accidental trauma, which occurred several years ago. These fractures were discovered during a routine full-mouth radiographic survey. Teeth were asymptomatic and tested vital to electric pulp tests.

J Okla Dent Assoc. 1994 Fall;85(2):30-3.

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Management of traumatized permanent incisor teeth with horizontal root fractures.

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Proper management of permanent incisors with horizontal root fractures includes careful diagnosis, continued re-evaluation and a conservative treatment approach. The location of the root fracture and pulpal vitality status both play important roles in proper treatment decisions. A thorough examination, judicious treatment and follow-up on the part of both dentist and patient can result in long term retention of many of these traumatized teeth.

Changgeng Yi Xue Za Zhi. 1989 Sep 20;12(3):183-6.

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[Horizontal root fracture repaired by cementum--a case report]

[Article in Chinese]

Lin KR, Kuo JS.

Horizontal root fractures are rare among dental trauma. According to Dr. Andreasen's report there are four types of repairs after root fractures. They are 1. healing with calcified tissue; 2. interposition of connective tissue; 3. interposition of connective and bony tissue; 4. interposition of granulation tissue. This report presented a case of horizontal root fracture in a 27 years old female patient. The patient had a trauma in the front teeth about 15 years ago. **Spontaneous healing occurred without dental treatment at that moment.** However, symptoms appeared recently as a dento-alveolar abscess. Radiograph revealed a horizontal fracture at the middle third of the root portion of the left upper central incisor, and irregular

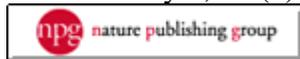
hard tissue over the fractured area. Histologically, the main component of repair tissue is

NOT SO HELPFUL LITERATURE

Br Dent J. 1994 May 7;176(9):349-50.

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Horizontal root fracture--an unusual complication.

Kothari P, Murphy M, Thompson J.

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Cystic change at the site of a root fracture is an unusual sequelae. A case report of such an occurrence in a horizontal root fracture involving the apical third of a permanent central incisor in a 22-year-old man is presented and management of these injuries is discussed in brief

Aust Endod J. 2000 Apr;26(1):15-8.

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Treatment of middle-apical level root fracture in necrotic teeth.

Sousa-Neto MD, Santos ES, Estrela C, Saquy PC, Pecora JD.

Faculdade De Odontologia, Universidade de Ribeirao Preto, Ribeirao Preto, SP, Brasil.

The purpose of this paper is to present two case reports of dental trauma with middle-apical level root fractures and pulp necrosis. The treatment consisted of programmed applications of calcium hydroxide until a calcified barrier was formed at the fracture level. The technique presented here proved efficient in treating horizontal fractures at the middle and apical thirds of the root.

Acta Odontol Scand. 1994 Aug;52(4):203-8.

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Influence of arch bar splinting on periodontium and mobility of fixed teeth.

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Altogether 17 patients treated with arch bar splints fixed onto teeth were tested at the time of splint removal and approximately 5 months later. Patients were treated with intermaxillary fixation (IMF) because of either orthognathic surgery (7 patients) or mandibular fractures (10). The CPITN index was used for estimating the periodontal status, and tooth mobility was measured with Periotest. Seven patients in the orthognathic surgery group could also be examined before splinting. Periodontal status, as shown with relative proportions of various CPITN indexes, worsened due to splinting but regained its original level at control examination a minimum of 5 months after splint removal. Since the mean Periotest values did not differ between the first and control examinations in the seven patients undergoing orthognathic surgery, the analysis of the effect of splinting on tooth mobility was performed from the values obtained immediately after splint removal and at control visit. Splinting was shown to increase Periotest values more in female patients, in younger ones, and in those who were splinted for a shorter period. Teeth with the smallest roots showed greater differences in Periotest values than those with large roots, and the greatest differences in mobility were observed in incisors.

Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2000
Aug;90(2):224-7.

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FULL-TEXT ARTICLE

Pattern of bone resorption in vertically fractured, endodontically treated teeth.

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PURPOSE: To evaluate the clinical pattern of alveolar bone resorption associated with vertically fractured, endodontically treated teeth in correlation to clinical symptoms. **Material and Methods:** The pattern of bone resorption was evaluated in 66 maxillary premolars, 13 mandibular premolars, and 31 mesial roots of mandibular molars extracted during an 18-month period because of vertical root fractures. Type and duration of symptoms were recorded and correlated to the pattern of bone resorption. **RESULTS:** A V-shaped pattern osseous defect (dehiscence) was typical (91%) to the buccal plate rather than a U-shaped shallow, rounded, slow grade resorption in the palatal or lingual plate. Fenestration of the buccal plate was observed in 10 patients (9%). A positive correlation between type of symptoms and amount of buccal bone resorption was found ($P < .0001$). The resorptive defect was always facing the fracture line.

CONCLUSIONS: A typical pattern of bone resorption in vertical root fracture cases as shown in this study can be helpful to the clinician in diagnosing vertical root fracture when an exploratory full flap surgical procedure is performed.

J Endod. 1999 Jul;25(7):506-8.

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An evaluation of endodontically treated vertically fractured teeth.

Tamse A, Fuss Z, Lustig J, Kaplavi J.

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For this survey, 92 vertically fractured endodontically treated teeth were evaluated clinically and radiographically before and after extraction. The maxillary second premolars (27.2%) and mesial roots of the mandibular molars (24%) were the most fractured teeth. In 67.4% of the teeth, a solitary buccal pocket was present; in 34.8%, a fistula frequently appeared closer to the gingival margin than to the apical area. A lateral radiolucency or a combination of lateral and periapical radiolucency was found in more than half of the cases. The general practitioners correctly diagnosed vertical root fracture in only one-third of the 92 fractured teeth in this survey.