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Case Report

Root fracture in immature anterior teeth followed for 15 years

Itoh T, Kojima Y, Nishioka T, Maki K, Kimura M. Root fracture in immature anterior teeth followed for 15 years. Dent Traumatol 2005; 21: 229–233. © Blackwell Munksgaard, 2005.

Abstract – We report a case of injury to an immature tooth, observed over a period of 15 years. In 1987, a 9-year-old boy fell down in a schoolyard. The right central incisor demonstrated palato-version and radiographic observations revealed that the roots of both central incisors were incomplete. Further, a root fracture in the apical region of the central incisors was observed. During the first treatment visit, the right central incisor was repositioned and both teeth splinted. After confirming that the line of fracture was aligned, the fixation was continued for 2 months. The teeth were examined periodically for the next 15 years. Both teeth had favorable outcomes with continued root development of both the apical and coronal segments with good apposition of the fracture lines.

T. Itoh[1], Y. Kojima[2], T. Nishioka[2], K. Maki[2], M. Kimura[2]

[1]Medical Foundation Itoh-kai Itoh Dental Clinic, Kumamoto, Japan; [2]Kyushu Dental College, Department of Pediatric Dentistry, Kitakyushu, Japan

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Kenshi Maki DDS, PhD, 2-6-1 Manazuru, Kokurakita-ku Kitakyushu-City, 803-8580 Japan
Tel.: 81 93 582 1131
Fax: 81 93 571 9555
E-mail: k-maki@kyu-dent.ac.jp

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In cases of injury to immature teeth, the dental age of the patient is frequently in the mixed dentition stage. Accordingly, the surrounding periodontal supportive tissue is also immature; thus, the injury patterns tend to vary, causing difficulty in choosing the best treatment procedure. According to a survey of tooth injury conducted by the Japanese Society of Pediatric Dentistry in 1996, the incidence for trauma to permanent teeth was high in the 7–9-year old (1, 2).

Root fractures are rarely seen in patients with immature teeth; however, luxation injuries are frequent as the alveolar cavity is highly elastic. Further, an incomplete dislocation is more frequently seen in teeth with immature roots, while fractures and complete dislocation are dominant in those with completed roots (1).

Generally, repositioning and fixation are given first priority for treating a luxation injury to immature teeth, although difficulties in ensuring fixation while in the mid-course of eruption often occur (3–7). These difficulties are caused by the absence of a suitable stable tooth for anchorage, as the dental age of the patient is in the mixed dentition stage.

Even if an ideal anchorage is present, the teeth are frequently fixed in a mid-line diastema position by necessity. Therefore, it is difficult to ensure a favorable prognosis at this state of tooth development. In the present case, we report root fractures to immature anterior teeth, observed over a period of 15 years following treatment.

Case report

A 9-year-old boy fell down in a schoolyard on May 10, 1987, resulting in tooth mobility and extrusion, which brought him to our hospital. No lip lacerations were observed. The right central incisor demonstrated palato-version, while the left central incisor showed no positional abnormality (Fig. 1). The mobility of the right central incisor was rated as grade 2. Radiographic observations revealed that the roots of both central incisors were not completed. The roots of both central incisors were fractured. Further, the lateral incisors were

beginning eruption with the crowns adjoining the fracture line of the central incisor roots (Fig. 2).

During the first treatment visit, the right central incisor was repositioned and splinted. For the purpose of reinforcing the fixation, the incisor was fixed together with the deciduous molar using an orthodontic appliance composed of a band and bracket. The fixation was continued for 2 months (Fig. 3).

Five months after treatment, the mid-line diastema had slowly closed to secure a space for eruption of the lateral incisor. Further, we confirmed that the apex on the left side was realigned. On the right side, the apex showed improvement, although it was separated in some parts. Both showed continued development that was nearly normal (Fig. 4).

An X-ray image taken 7 months after treatment is shown in Fig. 5, in which the fracture line can be

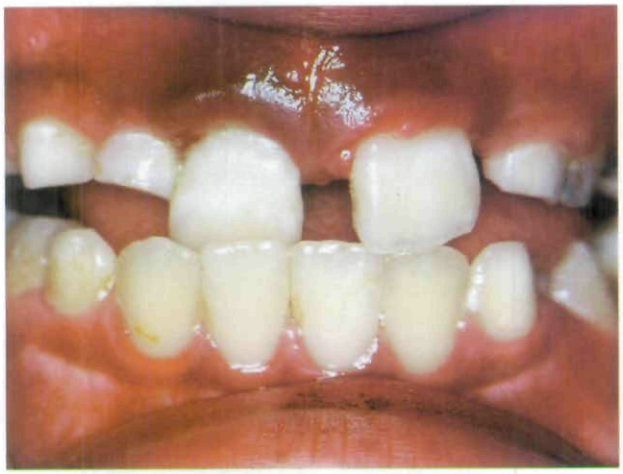

Fig. 1. Intraoral image showing a right central plate-version.

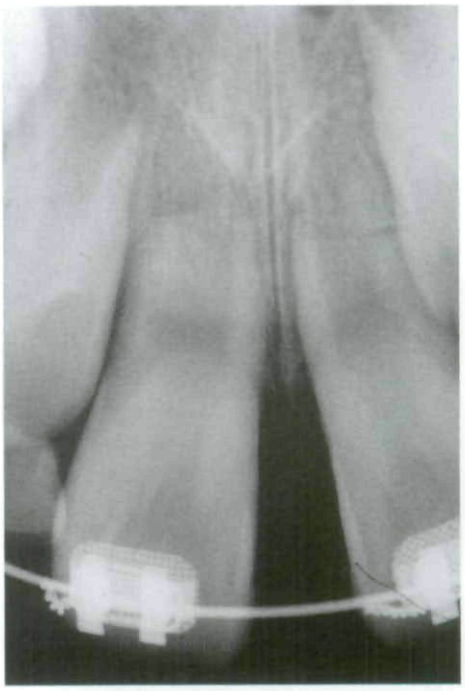

Fig. 3. Image taken at the first visit, showing that the tegmenta of the right central Incisor was improved at once for reposition and fixation.

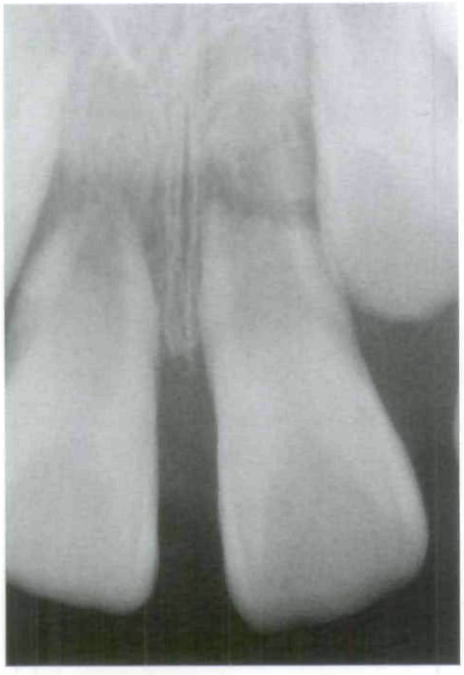

Fig. 2. Radiographic image showing the fractured tooth root of the central incisor.

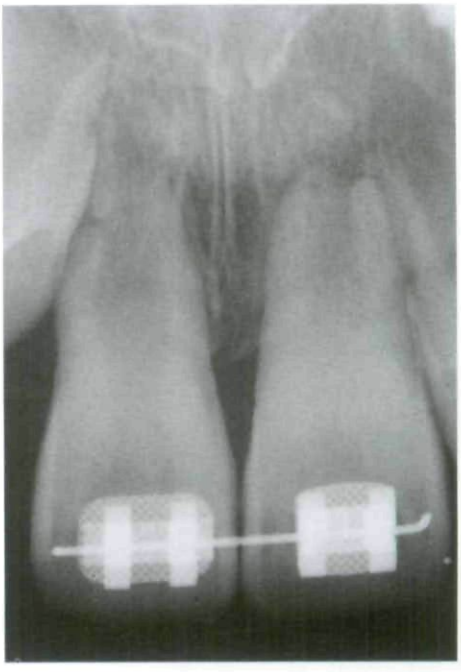

Fig. 4. Image taken 5 months after treatment, showing that the mid-line diastema has closed.

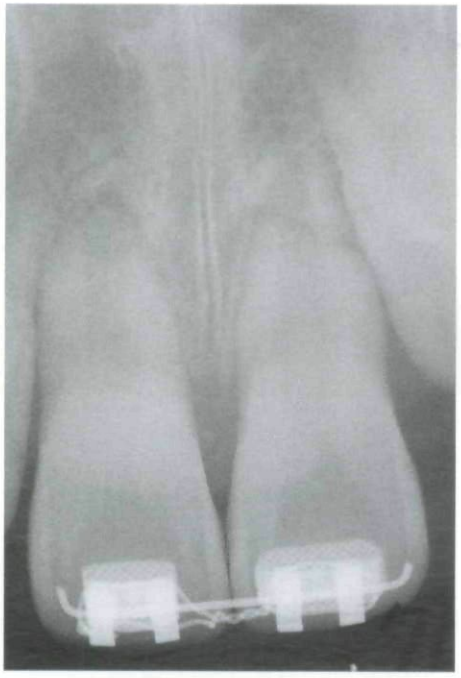

Fig. 5. Image taken 7 months after treatment, showing the fracture line running horizontally along the apex of both central incisors.

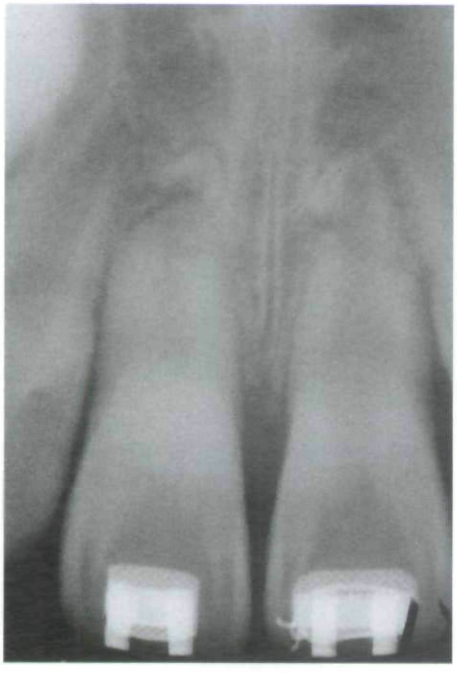

Fig. 6. Image taken 1 year after treatment, showing that reconstitution of the root on the apex side of the central incisor was favorable and the root apex demonstrating the healing process by calcification.

observed running horizontally along the apices of both central incisors. The apical segments were progressing favorably. In both incisors, continued root development could be seen indicating a vital pulp although a vital response to pulp testing was not obtained at this stage.

An X-ray image taken 1 year after treatment is shown in Fig. 6. The roots showed a continued favorable appearance with continued root development of both the apical and coronal aspects of the root.

Intraoral and X-ray images taken 5 years after treatment are shown in Figs 7 and 8, respectively. The teeth showed normal color and mobility, fusion

Fig. 7. Intraoral observations taken 5 years after treatment, showed no discoloration or mobility of both central incisors.

Fig. 8. Radiographic observations showing the root on the apex side of the left incisor has fused completely. However, restoration of the root morphology cannot be seen in a portion of the root apex of the right central incisor.

Fig. 9. Image taken 6 years after treatment. The root on the apex side of the bilateral central incisor shows no significant change as compared with 1 year before.

Fig. 10. Intraoral image taken 7 years after the injury revealing the bilateral central incisor of the maxilla with no discoloration of the crown.

Fig. 11. Intraoral image taken 15 years after the injury showing that the labio-version of the left canine is induced to the dentition, along with improvement of the midline diastema.

Fig. 12. Radiographic images taken 15 years after injury showing hard tissue in the resorption cavity of the root of the cleft central incisor, and the apex of the root of the right central incisor fused where it was once interrupted. The pulp cavity has disappeared and the root apex has followed a healing course by consecutive additions of hard tissue.

of the fractured segments and normal morphology in the left central incisor. The apical root of the right central incisor showed resorption and abnormal morphology. An X-ray image taken 6 years after treatment, at the age of 15, is shown in Fig. 9. At this time the pulp chamber of the right central incisor appeared completely obliterated, although both teeth still reacted to sensitivity testing. An intraoral image 7 years after the injury is shown in Fig. 10. The crowns of the teeth were normal. Redness and swelling of the gingival indicated poor oral hygiene. An intraoral image 15 years after the injury is shown in Fig. 11. A comparison of the status of the dentition and occlusion between 5 and 15 years after the injury revealed an improvement of the midline diastema condition. Both teeth still tested vital. An X-ray image taken 15 years after the injury is also shown (Fig. 12). Fusion was seen between the segments of both teeth and root obliteration was complete in the right central incisor and appeared to be continuing in the left incisor.

Discussion

As the chances of pulp necrosis are relatively low after an apical third root fracture, we did not perform endodontic treatment after the teeth were repositioned and in fact root canal treatment was not necessary over the 15 year evaluation period.

At different stages in the 15 year evaluation period, the radiographic appearance of the fracture appeared to correspond to each one of the reported healing reactions (8–11). However, at all times the clinical appearance of the crowns were normal without color change and the teeth responded to sensitivity testing relatively soon after the injury. Because of the appearance and tests indicating maintenance of vitality we postponed endodontic treatment and ultimately it was proven not to be necessary. This case demonstrates the importance of knowledge of the expectations after root fracture, as at many times during postoperative evaluations we were wavering between the uncertain sensitivity results and the radiographic appearance which indicated healing. As we were aware that the chance of recovery and healing is high, we continually elected to delay endodontic treatment until further recall and ultimately it appears not to have been necessary.

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