

HEALING OF HORIZONTAL ROOT FRACTURE : TWO CLINICAL CASES

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ABSTRACT

수평치근파절의 두 가지 치험례

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급격한 치아외상은 치아 경조직에 손상을 주기도 하지만 치수와 치주조직에도 손상을 입힌다. 탈구(luxation)의 경우, 외상에 의해 치근단공 부위에서 신경혈관계의 파괴가 초래되지만 치근파절의 경우에는 파절선 부위에서 이와 유사한 손상이 나타난다. 그러므로 치근파절을 파절선 상부의 치관부에 대한 일종의 탈구로 보기도 한다.

본 증례보고는 외상에 의한 치근파절의 두 가지 치유양상을 비교한 것으로, 한 증례는 특정한 치과적 처치없이 스스로 치유된 경우이고 다른 한 증례는 치아고정 및 근관치료를 포함한 치과치료후에 치유된 경우이다.

수평치근파절의 치유에는 여러 가지 요인이 관여하지만 특히 치아동요도 및 치수생활력이 큰 영향을 미친다. 본 증례에서와 같이 치아의 동요도가 있는 경우에는 고정을 통해서 치유를 촉진하고 치수의 괴사가 초래된 경우에는 근관치료를 포함한 적절한 치과치료를 통해서 치유가 일어날 수 있다. 따라서 치근이 파절된 경우에는 장기간의 관찰을 통해 파절부 치유 및 치수손상 여부를 관찰, 진단하고 그에 따른 적절한 처치를 시행해야 할 것이다.

주요어 : 수평치근파절, 치유, 치수괴사, 치아고정.

I . Introduction

Trauma to the teeth can result in various types of dento-alveolar injuries including root fractures comprising 0.5~7%¹⁻³⁾ of the injuries affecting the permanent dentition. This injuries predominantly affect permanent upper central incisors in the age of 11~20 years⁴⁾.

An acute dental trauma may imply impact to the dental hard tissues and damage to the pulp and periodontium. In luxation injuries, the trauma often results in rupture of neurovascular supply in the area of apical foramen. On the other hand, in root fractures, the same occurs at the level of fracture⁵⁾. Therefore root fracture is regarded as a kind of luxation injury to coronal fragment. From the moment of impact, healing processes are initiated that attempt

to repair or regenerate the damaged tissues including the pulp. The repair pattern of these fracture is influenced by the degree of dislocation and mobility, type of luxation, and stage of root development as well as localization of fracture⁶⁾. The prognosis of the coronal fragment depends mainly on its pulpal response⁷⁾.

This case report describes two different types of healing of horizontal root fracture after dental trauma. One is self-healing without any dental treatment, the other is with dental treatment including splinting and endodontic therapy.

II . Case Report

Case 1

A 38-year-old Korean female presented with

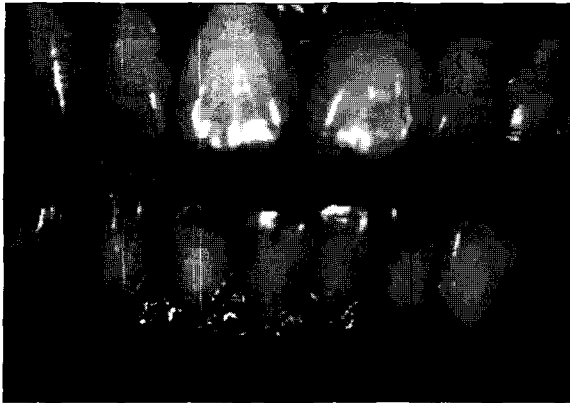


Fig. 1. The first visit clinical photograph showing class II crown fractures on both central incisors.



Fig. 3. Postoperative clinical photograph. Fractured crown areas on both central incisors were restored with composite resin.



Fig. 2. Radiograph five years after trauma. Upper right central incisor is divided into coronal and apical segments by a narrow horizontal radiolucent line. The apical end of coronal fragment reveals rounding.

alveolar bone resorption by periodontal disease. They also revealed evidence of rounding of the apical end of coronal fragment of the fractured teeth and fractured fragments were separated by a narrow radiolucent line (Fig. 2). The patient was treated only on fractured crown with composite resin (Fig. 3) since root fracture was considered healed without loss of pulp vitality.

Case 2

A 45-year-old Korean male was referred to our clinic, who had been traumatized by a traffic accident. He complained dull pain and tenderness to percussion on his upper right central and left lateral incisors. Upper left central incisor was lost by complete avulsion at the time of accident. On clinical examination, upper right central and left lateral incisors revealed Ellis class II crown fractures. Those teeth were sensitive to percussion and mobile. The diagnostic radiograph showed horizontal root fracture at apical third of left lateral incisor. Upper anterior six teeth were splinted with stainless steel wire and composite resin. During splinting period of six weeks, root fractured-lateral incisor showed positive

esthetic problem on her upper central incisors, which have crown fractures at incisal area (Fig. 1). Past medical history was uneventful. Past dental history revealed a traumatic injury on her upper incisors by falling down five years ago. However, the patient did not notice any clinical signs except esthetic problem. Therefore she did not visit dental clinic for dental treatment.

On the clinical examination, upper central incisors revealed Ellis class II crown fracture, but did not show any sensitivity to percussion or abnormal mobility. The teeth showed positive response to pulp vitality test using electric pulp tester and cold spray. The diagnostic radiographs showed horizontal root fracture on the left incisor combined with generalized



Fig. 4. Radiograph showing complete avulsion of the left central incisor and root fracture at apical third of left lateral incisor. Wire and resin splint were placed for the stabilization of root-fractured incisor.



Fig. 5. Radiograph shows only coronal fragment were treated endodontically. Some canal sealer is seen in the apical fragment.



Fig. 6. Three month-follow up radiograph showing healing of horizontal root fracture with apical calcification and rounding of coronal segment.

response to electric pulp test within normal range as before and no evidence of radiolucency or peridontal space widening at fracture area (Fig. 4). For that reason root fracture were considered healing in progress and referred to prosthodontic clinic for the restoration of lost upper left central incisor two months later. However, in the course of prothodontic treatment, left lateral incisor did not show any sensitivity to tooth reduction procedure for crown preparation under no local anesthesia. Pulp vitality test was done and left lateral incisor did not respond to electric pulp test and cold test. Endodontic treatment was planned. Since root canal instrument could not get in the apical fragment, root canal therapy was possible only in the coronal tooth fragment (Fig. 5). Three months later, no evidence of pathologic change was seen on the radiograph and prosthodontic bridge was placed. (Fig. 6).

III . Discussion

Trauma to the teeth can result in various types of dentoalveolar injuries. In root fractures, accurate

diagnosis at early stage is essential in deciding treatment plan and in predicting prognosis. Diagnosis of root fractures is accomplished by clinical and radiographic examinations. One must carefully evaluate mobility, the displacement of the coronal fragment, the presence or absence of tenderness and pain to palpation, and percussion of the teeth in question⁹⁾. Pulp testing must be carefully performed. A thorough diagnosis will disclose that a tooth with fractured root is usually tender to percussion, slight to very mobile, and may have some occasional bleeding in the gingival sulcus. In some cases fractured roots unfortunately have not evident clinical signs and does not diagnosed initial stage. Radiographic examinations are necessary, but root fractures can be overlooked because of the beam angulations. If the x-ray beam does not pass directly through the fracture line, it usually cannot be seen on the radiograph^{3,8,9)}.

Healing of root fractures has been investigated by Andreasen and Hjørtting-Hansen³⁾. They have proposed four alternative forms of repair, depending on the amount of separation of the fragments: (i) healing by calcified tissue when the fragments are in

close contact with very little mobility of the parts and a calcific callus can form, (ii) healing by interposition of connective tissue when the fragments seem slightly separated or some mobility of the parts is present and fibrous tissue developed between the fractured fragments, (iii) healing by interposition of bone and connective tissue when the fragments are further separated or clear mobility of the parts is present, and (iv) interposition of granulation tissue without healing when inflammation and granulation tissue will form between the fractured fragments, and bone resorption occurs. In the former case of the present report, there must be no severe mobility of tooth after trauma since the patient did not notice any discomfort. This first tooth was healed without any dental treatment including splinting or endodontic therapy, and its pulp vitality was remained. In the latter case of the present report, the tooth showed a little mobility and was splinted. It also received endodontic therapy and fracture was healed. In both cases, apical ends of coronal segments were rounded presumably by surface resorption.

The initial treatment for root fractures is firm stabilization of the injured tooth for 2~3 months⁴⁾. However a longer period of time may be required to ensure root fracture healing¹⁰⁾ which is considered by radiographs and clinical examinations such as percussion, mobility, and electric pulp tests. There should be a follow-up examination of at least a year to ensure that pulp necrosis has not occurred. But such period are often not realistic in practice. Pulp necrosis of root fractured tooth occurs with a frequency of about 20%³⁾, and is usually seen only in the coronal fragment. In these instances only endodontic treatment of the coronal fragment is necessary. Extirpation of the pulp in the coronal fragment would result at best in connective tissue union and never in union with hard tissue²⁾. Criteria for the diagnosis of pulp necrosis are grey color changes in the crown, periapical radiolucency and loss of pulpal sensitivity⁵⁾. Pulp necrosis is occasionally associated with spontaneous pain or tenderness to percussion,

but most cases are completely asymptomatic. In the present cases, the first patient didn't recognize any root fracture because of the absence of symptoms. But the root fracture was successfully healed probably by connective tissue by itself without pulp necrosis. On the other hand, the second patient had fractured root in which pulp was found to be necrotic two months after injury and root fracture was healed probably by connective tissue after endodontic treatment on coronal fragment. The apical fragments usually retains its pulp vitality and does not require any further treatment. However, pulp of the apical fragment occasionally may become necrotic as well. If this happen, when root canal treatment of the apical fragment is not possible, root canal treatment of coronal fragment and surgical removal of the apical fragment or extraction of the coronal fragment and orthodontic extrusion of the apical fragment are the preferred methods.

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