



Case Report

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Spontaneous healing of untreated horizontal root fracture occurred 22 years ago: A case report and literature review

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Abstract

Among all dental traumas, horizontal root fractures of incisor teeth have a high frequency. This case report describes an untreated horizontal root fracture of the maxillary right central incisor 11 which occurred 22 years ago after a trauma. This fracture was discovered during a classic X-ray examination in the mouth. The tooth showed no symptoms and responded positively to the pulp sensitivity tests.

Keywords: Horizontal root fracture, Root fracture healing, Prognosis factors.

INTRODUCTION

Root fractures are defined as fractures involving the dentine, the cementum, the pulp and the periodontal ligament [1, 2]. Their incidence is higher in the middle third and rarer in the apical and coronal third of the root [1, 2]. Root fractures are relatively rare. The frequency of root fractures in permanent teeth is only 0.5 to 7% [1, 8, 13]. The teeth most affected by root fractures are the maxillary incisors (central and lateral), whereas the mandibular incisors are much less affected (only 5%) [1, 13]. This case report describes a spontaneous healing of untreated horizontal root fracture which has occurred 22 years ago.

CASE REPORT

A 38-year-old man, with a good general health, presented to the department of Conservative Dentistry and Endodontics at University Dental Hospital Ibn Sina (Rabat, Morocco) to achieve a teeth bleaching. The patient did not report any particular symptomatology. Clinical and radiographic examinations were performed to look for carious lesions to be treated before starting the bleaching sessions.

The clinical inspection revealed a generalized yellowish discoloration on all teeth, a slight palato-version of the #11# and a carious lesion on the #47#.

The radiographic interpretation allowed the fortuitous discovery of a horizontal root fracture located at the junction of the middle third and apical third of the maxillary right incisor #11#.

The trauma history revealed an old trauma in the maxillary anterior area which has occurred 22 years ago (since the patient was 16 years old) without any treatment.

Regarding the tooth in question, the patient did not report any history of pain or swelling or infection. Clinical examination revealed a slight palato-version of the tooth #11#, the coronal fragment of the fractured tooth showed a yellowish coloration identical to that of the adjacent teeth (Fig 1), mobility was normal and tenderness to percussion was not painful. Thermal and electrical tests were positive. The same tests were also performed on the adjacent teeth as well as on the lower incisors. Their responses were identical to the tooth in question with a slight delay in the maxillary teeth compared to the mandibular teeth.

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Figure 1: Clinical appearance of the tooth #11#

The radiographic examination revealed a horizontal root fracture located at the junction of the middle third and apical third of the

maxillary right incisor #11#. The camel pulp is slightly retracted and the pulp canal space is obliterated in the apical third of the root (Fig 2).

Internal root resorption is not detectable. The periodontal space is normal and interrupted at the level of the fracture line. Lamina dura has a normal appearance. The periapex does not present any radiolucent image. The root fracture appears as a simple horizontal line, of total extension slightly curved with a slight external surface resorption on the mesial and distal side of the fracture line. We suspected other fractures on the adjacent teeth, particularly the #12# and the #21#, which led us to take an occlusal X-ray in order to look for other fractures and to estimate the degree of displacement of the fractured fragments. The occlusal view confirmed the horizontal root fracture at #11# and could not reveal any other fractures on the adjacent teeth (Fig 3).



Fig 2.a



Fig 2.b



Fig 2.c

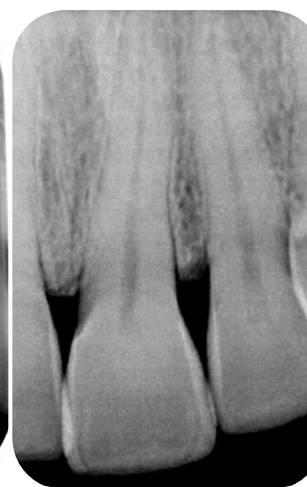


Fig 2.d

Figure 2: Radiographic examination: **a.** horizontal root fracture in the junction of the middle third and apical third of the maxillary right central incisor #11#. **b.** Periapical radiograph confirming the fracture. **c.** Periapical radiograph centered on #11# and #21#. **d.** Periapical radiograph on #21# and #22#.



Figure 3: Occlusal X-ray confirming fracture at #11# and showing no other fracture on adjacent teeth

The use of radiographic examination, while complementary, is very useful to confirm the diagnosis by the presence of fracture line and to estimate the prognosis by the evaluation of other parameters such as: degrees of separation between the two root fragments, space relative to root canal filling, double images of external root surfaces, bone destruction, periodontal ligament enlargement and radiographic image suggestive of periodontal disease [10, 15]. Since the use of cone beam scanning (CBCT) in dentistry, this technique has largely proved its success for diagnostic and prognostic imaging of diseases of the oral sphere such as trauma including root fractures. The effectiveness of this technique is strictly superior to other radiographic methods [10].

The histological reactions to the horizontal root fracture

Andreasen & Hjørting-Hansen described four types of histological reactions occurring at the fracture line

- (I) interposition of calcified tissue (callus formation).
- (II) interposition of connective tissue, which is characterized by peripheral rounding of the fracture's ends;
- (III) interposition of bone and connective tissue, radiologically characterized by the clear separation of the two fragments;
- (IV) interposition of granulation tissue, caused by an infected or necrotic pulp [2, 4].

DISCUSSION

Diagnosis of horizontal root fracture

An appropriate diagnosis of teeth with root fractures is an essential step which directly affects the treatment plan to be adopted later. To complete this step successfully, a rigorous clinical and radiographic examination is recommended.

Clinically, tooth color inspection, sensitivity and vitality tests, percussion and mobility tests should be routinely performed [15].

Generally, the coronal fragment of a root-fractured tooth may be extruded and displaced to the palatal or lingual region. Other traumas may affect the coronal fragment such as concussion, subluxation, extrusion and lateral dislocation with or without alveolar bone fracture, depending on the severity of the trauma [4]. In this case, there was no extrusion but a slight palato-version of the coronal fragment of the tooth #11#.

Healing was likely with bone surrounded by connective tissue in this case.

How to explain this healing reaction?

The type of repair observed in this reported case would be possible only in the presence of vital pulp tissue. This can be explained by the fact that when the pulp keeps its vitality, odontoblasts and cement cells usually stimulate the healing process [12]. Then, a hard tissue is deposited forming a barrier to unite the two fractured fragments as in the case of exposed coronal pulp. But when the pulp is damaged, a process of revascularization intervenes to ensure pulp healing and results in calcification of the coronal pulp [5]. During this process, the activity of the periodontal cells results in the formation of a connective tissue between the two segments ensuring their union [5]. This results in an enlargement of the pulpal diameter, thus an increase in the interface between the root canal and the vascular system of the apical pulp and possibly between the surrounding periodontal spaces as well, from which new blood vessels can develop and can invade the damaged pulp [1]. Moreover, the accelerated apposition of the dentine resulting in the obliteration of the pulp is a phenomenon that often accompanies the process of revascularization of a damaged pulp; but could also be a result of additional trauma that may be suffered by an already injured pulp [3].

This could explain the healing potential at the fracture site.

What is the prognosis of a tooth with a horizontal root fracture?

The prognosis of a tooth with a root fracture depends on several factors such as :

- the site of fracture: coronal, middle or apical-third;
- the extent of dislocation of the fragments: concussion, subluxation or lateral luxation; with or without occlusal trauma;
- the fracture type: simple or multi-lined fracture,
- the fracture extension: partial or total,
- the stage of root development: close or open apex;
- the status pulp tissue at the time of injury and the time interval between trauma and treatment [1-3, 5, 8, 13].

In general, Horizontal root fractures situated on the middle or apical third of the root present better prognosis in comparison with vertical fractures [9].

The follow-up

Both clinical and radiographic controls to assess pulp vitality should be performed for 1 month to 1 year to detect any sign of pulpal necrosis.

however, when the pulp still responds negatively to the vitality and sensitivity tests (electrical and thermal) after 3 months of follow-up and if the radiographic control shows a radiolucency near the fracture line, at that time, the decision to undertake endodontic treatment is taken [15].

The occurrence of pathological changes several years after the trauma is possible, hence the importance of establishing a rigorous long-term follow-up of the lesions [6].

However, healing of root fractures without treatment is also presented and described in many reports [5, 6, 11, 13, 14]. As illustrated in this case, the pulp can preserve its vitality and the fractured fragments can heal without any pathological symptoms several years after the traumatism.

CONCLUSION

It can be deduced that the fractured roots can spontaneously heal. It relies on several factors of which the most important is the pulp vitality [4]. After an adequate follow-up period, if the pulp still responds negatively to vitality and pulp sensitivity tests or if the tooth shows symptoms such as pain or discomfort, endodontic treatment is then considered in the coronal part only [13]. Therefore, endodontic treatment can only be initiated if there is evidence of pulp necrosis, as reported by the International Association of Dental Traumatology in its guidelines for the management of root fractures (Flores *et al.*, 2007) and recommending that endodontic treatment can be considered only after pulpal necrosis, and not as a prophylactic intervention [9].

Conventionally, endodontic treatment is the treatment of choice for traumatized teeth with a horizontal root fracture, where pulpal necrosis has occurred [17]. However, the concept of endodontic regeneration can also be used in the management of these teeth while taking into account indications and conditions of realization [16].

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Conflict of Interest

None.

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