

Root fracture in the permanent maxillary central incisors: a case report of 10 years follow-up

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Abstract: The objective of this case report is to present a 9-year-old female patient who suffered horizontal root fracture in the middle third of the two upper central permanent incisors. The teeth were splinted with composite resin in the proximal teeth involved in the trauma. After, the patient was referred to the pediatric dentistry clinic, where she received clinical and radiographic care for a period of ten years. Endodontic intervention was not necessary on both central incisors teeth. Tooth 11 healing by interposition of bone and connective tissue, and teeth 21 healing by interposition of connective tissue. After ten years, the teeth presented without any significant signs or symptoms requiring an invasive intervention. It is concluded that the patient's cooperation regarding care, oral hygiene and attendance at the return appointments, can be decisive for the success of the treatment.

Key words: Tooth Injuries, Dentition Permanent, Child.

Fratura radicular nos incisivos centrais superiores permanentes. Relato de caso de 10 anos de acompanhamento longitudinal.

Resumo: O objetivo deste trabalho é referir-se, por meio de um relato de caso clínico, sobre um paciente de 9 anos de idade, sexo feminino, que sofreu queda da própria altura na escola. A paciente recebeu atendimento em sua cidade de origem, em que ao exame clínico foi observado traumatismo dentário sobre os dentes 11 e 21 e o dente 11 sofreu suave luxação extrusiva sendo reposicionado pelo cirurgião dentista que prestou os primeiros atendimentos. Ao exame radiográfico foi constatada fratura radicular horizontal de terço médio nos dois elementos dentários. Foi realizada a contenção dos dentes com resina composta nas proximais dos dentes envolvidos no trauma. A paciente foi encaminhada para a clínica de Odontopediatria da FOA-Unesp onde recebeu atendimento clínico e radiográfico por um período de dez anos, sem que a mesma apresentasse sinais ou sintomas significativos que necessitasse de uma intervenção invasiva. Dessa forma, infere-se que uma correta atuação no primeiro atendimento e a preservação do caso, pode ser determinante para o sucesso do tratamento, assim como a colaboração do paciente quanto aos cuidados, higienização bucal e comparecimento nas consultas de retorno.

Palabra-chave: Traumatismo Dentário, Dentição Permanente, Criança.

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Fractura radicular en los incisivos centrales maxilares permanentes: reporte de un caso de 10 años de seguimiento

Resumen: El objetivo de este trabajo es referir, a través de un reporte de caso clínico, a una paciente de sexo femenino de 9 años que sufrió una caída de su propia altura en el colegio. Inicialmente, la paciente acudió a urgencias en su ciudad natal, en la que al examen clínico se objetivó un traumatismo dentario en los dientes 11 y 21 y el diente 11 sufrió una luxación extrusiva leve, siendo reposicionada por el odontólogo que le brindó la primera atención. El examen radiográfico reveló una fractura radicular horizontal en el tercio medio de los dos incisivos centrales superiores. Los dientes fueron ferulizados con resina compuesta en los dientes proximales involucrados en el trauma. Posteriormente, la paciente fue remitida a la consulta de odontopediatría de la FOA-Unesp, donde recibió atención clínica y radiográfica por un período de diez años. No fue necesaria la intervención endodóntica en ambos dientes incisivos centrales, y los procesos de cicatrización se dieron de dos maneras diferentes. Cicatrización del diente 11 por interposición de hueso y tejido conectivo, y cicatrización del diente 21 por interposición de tejido conectivo. Después de diez años, los dientes se presentaban sin signos o síntomas significativos que requirieran una intervención invasiva. Se concluye que en un mismo paciente ocurren diferentes procesos de cicatrización en dientes muy próximos entre sí y que la cooperación del paciente en cuanto a cuidados, higiene bucal y asistencia a las citas de retorno, puede ser determinante para el éxito del tratamiento.

Palabras clave: Traumatismo de los dientes, Dentición Permanente, Niño.

Introduction

It is known that dental trauma is more common in children and young adults and the main causes are falls, sports practices, bike accidents, violence and car accidents¹. In countries where caries control has become effective, dental trauma is the greatest oral health problem among young people and children, especially involving anterior teeth, due to their bone immaturity; and the prevalence of these injuries has increased in the last 10-20 years.^{2,3}

Among dental traumas, root fracture is a intraalveolar fracture involving dentin, cementum and pulp, and according to Andreasen they are relatively uncommon, accounting for 0.5% to 7% in permanent teeth and 2% to 4% in primary teeth⁴. The teeth most frequently affected are the upper incisors, with a percentage of

75% in permanent teeth, and the age group from 11 to 20 years is the most affected⁵. It can be horizontal, oblique, or a combination of both, and they can be located in the cervical, middle and apical root thirds. Horizontal fractures occur mainly in the anterior maxillary region, frequently affecting the middle root third and rarely the apical third due to a frontal impact⁶. The clinical and radiographic follow-up must follow a protocol involving regular follow-up after 30 days, 2, 4, 6 and 12 months⁷. A high success rate should be expected for these cases (60-80%)⁸. Based on scientific evidence, cases of horizontal root fractures showed a higher percentage of teeth with maintenance of pulp vitality than other displacement injuries without root fracture. Around 80% of teeth with fractured roots maintain vitality⁸.

Usually, four types of healing sequelae can be found, namely: repair with calcified

tissue, promoting union in the fracture; connective tissue repair; repair with connective and calcified tissue; and repair with granulation tissue.^{9,10}

This case report presents a successful case in a 9-year-old girl who suffered a horizontal root fracture in the two upper central incisors. The patient was followed for a period of 10 years. The procedures performed and difficulties observed during patient follow-up will be reported.

Case Report

A female patient, aged 9 years, with a history of dental trauma in both upper central incisors, after suffered a fall from his own height at school. According to the patient's mother, immediate treatment had been initiated by another clinician who performed composite resin fixation involving teeth 11 and 21. After 48 hours and under our care, the treatment plan was explained and written informed consent was obtained from the patient and his parents. The first fixation was removed, since it was not in good condition. In the clinical examination the upper right incisor exhibited moderate mobility and was slightly extruded, and the upper left incisor had light mobility, yet was in normal position. There was no sensitivity to palpation, but both traumatized teeth were sensitive to percussion and responded normally to the cold spray vitality test (Endo Ice, Maquira, PR, Brasil).

The radiographic examination revealed a horizontal root fracture at the middle third level of the upper central incisors, both

of which had incomplete root formation [Figure 1]. Treatment consisted of rigid fixation with 0.5 mm orthodontic wire and light curing composite resin (from lateral incisor to lateral incisor) [Figure 2]. Anti-inflammatory drugs were prescribed for 3 days, with patient guidance and control. Thirty days after fixation, the injured teeth did not present color changes, and the thermal and electrical tests did not suggest pulp necrosis. Regular clinical and radiographic follow-up was performed after 2, 4, 6 months and 1, 3, 5 and 10 years.



Figure 1 - Initial radiographic image of upper central incisors with horizontal root fracture in the middle third level.



Figure 2 - Stabilization by rigid splinting with orthodontic wire bonded to the four incisors with composite resin

The fixation was removed after 4 months and clinically the right central incisor remained with mild mobility. After a week, since the child reported a lot of fear of chewing with the traumatized teeth, especially the tooth that still had mobility, we decided to maintain the fixation for further 2 months. After this period, the fixation was removed, both incisors were within normal limits and the patient reported no discomfort with the teeth and no pain during horizontal and vertical percussion tests. Three months after trauma, there was resorption of the pulp canal walls in both teeth [Figure 3]. Radiographic examination after 6 months showed onset of pulp canal obliteration of the right upper incisor [Figure 4]. After three years, the process of resorption had ceased and total obliteration of apical and coronal pulp canals of the upper right incisor can be seen [Figure 5].

The analysis of the repair process of the periradicular area of traumatized teeth was carried out. Radiographically, traumatized teeth showed different responses. The upper right central incisor healing by



Figure 3 - A radiographic image of traumatized upper central incisors 3 months after the trauma. A resorption of the pulp canal walls can be seen.

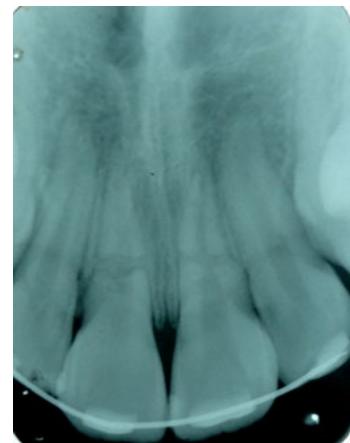


Figure 4 - A radiographic image after 6 months showing onset of pulp canal obliteration of the right upper incisor



Figure 5 - Three years after trauma. Total obliteration of apical and coronal pulp canals of the upper right incisor and consolidation of the both roots



Figure 6 - Clinical view 10 years after the dental trauma. The upper central incisors with healthy aspects responds positively to the pulp test.



Figure 7 - Radiographic evaluations after 10 years showing different healing processes.

interposition of bone and connective tissue between fragments, while the left central incisor healing by interposition of connective tissue [Figure 5]. All upper anterior teeth were followed clinically and radiographically after 5 and 10 years, during which the incisors exhibited the same radiographic aspects as in the previous period and a continuous positive reaction to vitality tests and no signs of pain or discomfort or color changes [Figures 6 and 7]. This case report was prepared in accordance with the PRICE 2020 Guidelines.¹¹

Discussion

The prognosis of root fractures depends on the region of the fractured root, extension of fracture line, location of pulp tissue, displacement of fragments and the patient's general health¹. Clinical examination of teeth with root fractures reveals mild extrusion of affected teeth, often with lingual displacement. The fracture site

in the root determines the mobility of the tooth affected by fracture; however, in most cases, it may not be possible to clinically distinguish a displacement caused by root fracture from a case of dislocation, thus the final diagnosis is dependent on radiographic examination⁴. In the present case, the patient suffered a dental trauma that caused a horizontal root fracture in the middle third of teeth 11 and 21. Bleeding occurred and tooth 11, which presented mild extrusion.

Treatment of root fracture in permanent teeth depends on where the root fracture occurs⁵. For cases of fracture in the middle root third, the recommended treatment is immediate repositioning of the displaced coronal portion and fixation for a period of 4 weeks. For some authors, rigid fixation should be maintained for 2-3 months to allow matrix deposition in accordance with the principles of root healing^{4,12}. In the present case, retention was maintained initially for a period of 2 months. After fixation removal, tooth 11 still had mild mobility, which caused patient fear to use the tooth in chewing functions. For this reason, a new fixation was performed for further 2 months, totaling 4 months of fixation, and after removal the patient felt much safer due to the greater tooth stability. In the first year the patient was evaluated at 2, 4, 6 and 12 months.

After one year of clinical and radiographic follow-up, the sessions were scheduled once a year. It is advisable to monitor fracture healing for at least one year, as well as the pulp tissue condition. The pulp of an immature permanent tooth has considerable capacity for healing after a traumatic root fracture⁶. For cases of fractures in the middle third, pulp vitality

is usually maintained, thus endodontic treatment is not necessary.¹⁰

Radiographic observation demonstrated that in the present case, tooth 21 presented healing by interposition of connective tissue. This type of repair is more common in teeth with incomplete root formation, which maintains the pulp tissue vitality, if there was little displacement at the time of trauma⁹. Clinical examination of teeth with this type of healing reveals normal mobility. In relation to tooth 11, interposition of bone and connective tissue was observed; this type of healing is an evident result of trauma that precedes the complete growth of the alveolar process, thus the coronal

fragment continues to erupt, while the apical fragment remains stationary in the maxilla⁹. Radiographically, a bony bridge is observed separating the fragments, with periodontal space around both. In this case, both the central incisors were firm and had normal response to the pulp vitality tests, and endodontic intervention was not indicated. From this report, it is concluded that in dental trauma of teeth with root fracture different healing processes occur in teeth in close proximity to each other; and that the long-term follow-up is recommended, so that any necessary procedures may be performed to maintain the teeth in the oral cavity.

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Recibido: 25/03/22

Aceptado: 05/08/22

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