

OUTCOME OF TREATMENT OF HORIZONTAL ROOT FRACTURE USING THERMAFIL AND SURGICAL PROCEDURE: A CASE REPORT

Ernani da Costa Abad¹, Luis Claudio Campos², Mauricio Santa Cecilia³ and Amauri Favieri^{4*}

Received on December 12, 2008 / Accepted on February 17, 2009

ABSTRACT

This paper reports the endodontic retreatment of an upper left lateral incisor, which has received a direct trauma and has fractured horizontally on the middle third of the root. In order to avoid the use of axial forces, cleaning and shaping procedures were performed using an ultrasonic technique. The canal was surgically filled by means of a titanium Thermafil obturator with the purpose to stabilize and keep together the root fragments. After ten-year follow-up period, the absence of clinical signs and symptoms was evidenced as well as the radiographic normality.

Keywords: root fracture, Thermafil, follow-up.

RESUMO

Este artigo relata o retratamento endodôntico de um incisivo lateral superior esquerdo, que apresentou uma fratura horizontal na altura do terço médio da raiz, após ter sofrido um trauma direto. Com o objetivo de evitar o uso de forças no sentido axial, os procedimentos de limpeza e formatação do canal radicular foram confeccionados pela técnica ultra-sônica. A seguir, o canal radicular foi obturado durante um procedimento cirúrgico por meio de um obturador Thermafil de titânio, com a finalidade de manter juntos, e estabilizados, os fragmentos da raiz. Após 10 anos de acompanhamento é possível observar ausência de sinais e sintomas clínicos, assim como normalidade radiográfica.

Palavras-chave: Fratura radicular, Thermafil, acompanhamento clínico e radiográfico.

Correspondence to: Prof. Dr. Amauri Favieri

*Rua Visconde de Pirajá, 303/706, Ipanema, 22410-001 Rio de Janeiro, RJ, Brazil.

¹DDS, PhD, Professor of Endodontics Department, Estácio de Sá University, Rio de Janeiro, Brazil. – E-mail: endoabad@resdetahoo.com.br

²DDS, MSc, Professor of Endodontics Department, Veiga de Almeida University, Rio de Janeiro, Brazil. – E-mail: luisccampos@click21.com.br

³DDS, MSc, PhD, Professor of Endodontics Department, Federal Fluminense University, Nova Friburgo, RJ, Brazil. – E-mail: msantacecilia@uol.com.br

⁴DDS, MSc, PhD, Professor of Endodontics Department, Federal Fluminense University, Nova Friburgo, RJ, Brazil. – E-mail: amaurifavieri@ibest.com.br

INTRODUCTION

Andreasen [1] states that the root fractures in permanent teeth are relatively infrequent occurrences, implicating in 0,5 to 7% of all dental traumas. Fractures are mainly observed in central incisors of young patients. The success of the treatment of root fractures depends upon the degree of the fragment displacement and the fracture localization. The closer to the crown the greater the risk of contamination via gingival crevice, and the more apical the better the prognosis [2].

In some situations, with the repositioning of the crown fragment and further immobilization of the tooth, revascularization of the pulp occurs and there is no need of endodontic treatment [3]. It is interesting to note the importance of the clinical-radiographic follow-up for a period of, at least, a year [4]. However, when coronal pulp necrosis is detected, and the apical fragment is vital, the endodontic treatment of the crown fragment must be performed. When pulp necrosis of both fragments occurs, and the root canal of the apical portion is accessible, the endodontic treatment of both fragments must be carried out.

Johnson [5] introduced a new root canal filling method, using a flexible metal endodontic instrument coated with a layer of gutta-percha and placing it in the flame of an oil lamp until its plastification takes place. In 1988, the Johnson method was commercialized with the name of *Thermafil Endodontic Obturator* [6]. The Thermafil obturator consists of a flexible central carrier; made of stainless steel, titanium or plastic; coated with a compact and uniform layer of alpha phase gutta-percha [6, 7]. Comparing the conventional beta-phase with the alpha phase gutta-percha the latter presents lower fusing and plastification temperatures [6, 7]. Furthermore, when heated, the alpha gutta-percha shows viscosity, adhesiveness, and high flow ability, favoring the filling of lateral canals and irregularities of the main canal [6, 7]. Moraes et al. [8] studied the alpha gutta-percha sealing ability, comparing it to the conventional beta gutta-percha and found significant superior results with the former. Several authors investigated the Thermafil technique reporting good laboratorial [9] and clinical results [10, 11].

In 1993, Gençoglu [11] reported a successful treatment of a central incisor with an intra-alveolar horizontal fracture in the middle of the root with n. 60 Thermafil obturator. The present paper describes a surgical endodontic retreatment of an upper left lateral incisor with fracture on the middle third of the root utilizing the titanium Thermafil.

Lipski [12] showed in a comparative analysis of the efficacy of root canal filling with laterally condensed gutta-percha and Thermafil obturators with titanium carrier performed on the basis of experimental and clinical findings. No differences were observed between groups as two homogeneity or adaptation of root canals filling. The seal

evaluated using the linear dye penetration test revealed no differences between both types of root canal filling.

Gençoglu et al. [13] in a *in vitro* study, showed that the core (gutta-percha or gutta-percha and carrier) sealer and the sealing ability were calculated based on 4 different gutta-percha techniques: Thermafil, JS Quick-Fill, System B, and lateral condensation. Root canals filled with JS Quick-Fill and Thermafil contained more core material than did those obturated with lateral condensation and System-B. The lateral condensation showed the worst core/sealer ratio. Thermafil and JS Quick-Fill had at significantly less dye leakage than lateral condensation technique.

Chu et al. [14] evaluated the outcome of root canal treatment using either Thermafil or lateral condensation as filling technique and to compare the time required for the treatment when either filling technique was used. Using Thermafil or lateral condensation in the filling of root canals did not results in significant differences in the clinical treatment outcome. The use of Thermafil obturators seems to be less tedious and time-consuming when compared to laterally condensed gutta-percha.

Kocak S et al. [15] describes the treatment of a horizontal mid-root-fractured incisor with an alternative fixation technique. As a result of clinical signs of pulpal necrosis, both the coronal and the apical root fragments were endodontically treated and obturated at single visit, and the fragments were stabilized internally through insertion of a stainless-steel endodontic file into the root canal. Four-year follow-up examination revealed satisfactory clinical and radiographic findings with hard tissue repair of the fracture line. This technique can be a quick remedy for patients with root-fractured tooth, especially for those who cannot make a second visit to the dental clinic.

CASE REPORT

A thirty-year-old white woman came to our office complaining of presence of a sinus tract in the region adjacent to her upper left lateral incisor (Fig. 1). She reported the occurrence of a direct trauma in the area approximately 18 months ago. At that time, the patient, noting that the tooth had been badly injured, went to a general dentist who had performed the first endodontic treatment. The radiographic examination showed that the first obturation was restricted to middle third of the root canal, and the apical third remained untreated. It was also noted the presence of a horizontal fracture on the root middle third as well as an evident periradicular lesion (Fig. 2). In addition, the patient complained of tenderness to vertical percussion as well as the palpation of the underlying tissues of the injured tooth.



Figure 1 – Initial clinical aspect. Note the presence of the fistula on the upper left lateral incisor.



Figure 3 – Splinting carried out at the beginning of the root canal retreatment.



Figure 2 – Preoperative radiograph evidencing horizontal fracture on the middle third of the root and evident periradicular lesion.

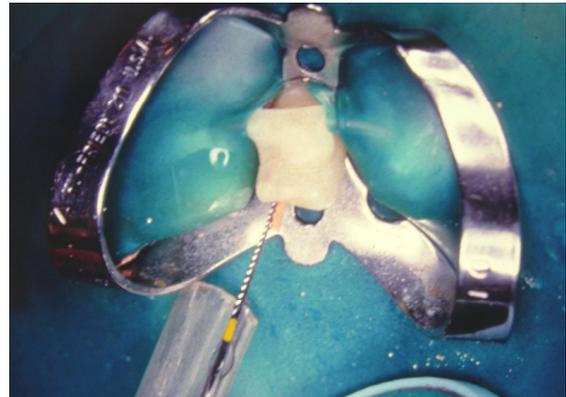


Figure 4 – Gutta-percha removal using the ultra-sonic device.



Figure 5 – Radiograph taken after the removal of the root canal obturating material.

Initially, it was proposed the removal of the root canal filling material. Following the Prilocaine chloridrate anesthesia (30 mg) and Felipressina 0,03 U.I.¹, a semi rigid splintage of the injured tooth was made with nylon thread #90 and light cured resin² (Fig. 3). Xylol solvent³ was used to remove the filling material from the root canal together with hand K type files⁴ and the ultra-sonic ENAC device⁵ (Fig. 4). After filling removal (Fig. 5), the sequence of the endodontic treatment was carried out surgically.

¹Astra Química e Farmacêutica Ltda – Sandoz/Swis

²APH/Dentsply Ind e Com Ltda – Brazil

³Herpo Produtos Dentários Ltda – Brazil

⁴Maillefer – Swiss

⁵Osada Dental Products – Japan

Following the incision, the root fragments were exposed (Fig. 6) and the root alignment was achieved, which allowed pass a K-type file into the canal through the fracture line and to determinate the working length (Fig. 7). Following the complete instrumentation, the root canal obturation was performed using #45 titanium Thermafil⁶ and Sealer 26⁷ sealer. Titanium Thermafil was the material of choice because of carrier's high rigidity, what would certainly favor the union and stabilization of the fragments (Fig. 8).

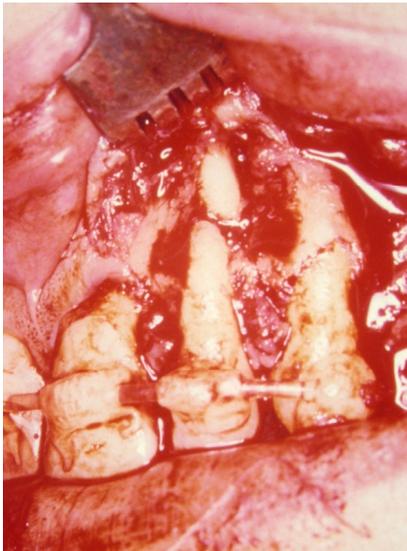


Figure 6 – Surgical exposure of the radicular fracture.

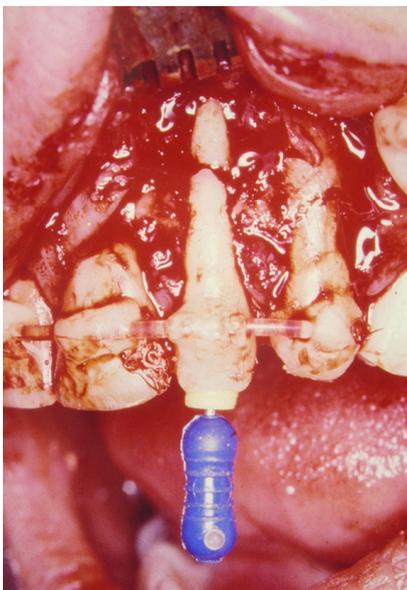


Figure 7 – Surgical root alignment.



Figure 8 – Postoperative radiograph.

The splint was removed after 30 days. Follow-up extended for ten years, when it could be observed the absence of signs and symptoms and evidence of periradicular repair (Fig. 9). Regardless of the proximity of the fracture site on the distal surface to the sulcus, probing revealed the absence of periodontal defects (Fig. 10).



Figure 9 – Radiograph after eight-years follow up. Note the normality of the periradicular region.

⁶Tulsa Dental Products – USA

⁷Dentsply Ind Com Ltda – Brazil

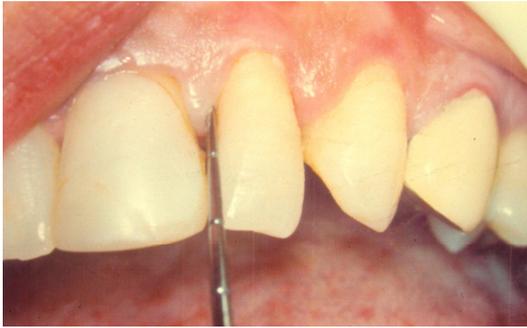


Figure 10 – Clinical photograph showing absence of communication between the gingival crevice and fracture area.

DISCUSSION

A horizontal root fracture may be a common accident following a frontal traumatism [16, 17]. Prognosis is extremely poor in cases where the pulp has become necrotic and there was a severe displacement of fragments. This fact is due to difficulties found in the replacement and stabilization of the fractured fragments [11, 15]. In such cases, the use of Thermafil obturators can represent an adjunct to splint in immobilizing the tooth, since the plastic or metallic core could act in the stabilization and joining of the fractured fragments [15].

Thermafil was the filling instrument chosen for the present study because it enables better fixation and balance (due to a metallic carrier) after the re-alignment of dental root fragments. Besides, we intended to use a filling technique that could be carried on quickly enough and that would be homogeny [12] in the results independently of the presence of filling cement.

It should be underscored that in this case removal of the root canal filling and further instrumentation were performed using the ultrasonic technique, with the purpose to avoid axial forces exerted in the coronal direction, which might make difficult the cooptation of the root fragments.

Following raising the mucoperiosteal flap, a haemostatic plier was used to approximate the fragments and to allow the accomplishment of the root canal filling. Accordingly to Andreasen [3], the presence of connective tissue between fragments is an acceptable indication of healing in cases of root fracture. In addition, that author also reported that the lost of marginal bone rarely occurs in such cases, which was observed in the present case after 10-year follow-up. Ten-year follow-up examination revealed satisfactory clinical and radiographic findings with hard tissue repair of the fracture line. The checking appointments consisted of visual inspection, percussion

tests, periodontal probing and periapical x-ray. Ten years after case had been concluded, the tooth does not present any kind of alteration shown by x-ray or any symptom that would characterize failure of the treatment.

REFERENCES

- [1] Andreasen JO. 1979. Etiology and pathogenesis of traumatic dental injuries. A clinical study of 1298 cases. *Scand J Dent Res*, 78: 329–42.
- [2] Rosenstein DI, Albert TW, Chiodo GT & Eigner TL. 1983. Treating the horizontal root fracture. *Gen Dent*, 1: 25–6.
- [3] Andreasen FM & Andreasen JO. 1994. Root fracture. In: Andreasen JO & Andreasen FM. Text-book and color Atlas of injuries to the teeth. 3rd ed. Copenhagen: Munksgaard International Publishers: 279–314.
- [4] Cvek M. 1994. Endodontic management of traumatized teeth. In: Andreasen JO & Andreasen FM. Textbook and color Atlas of traumatic injuries to the teeth. 3rd ed. Copenhagen Munksgaard International Publishers: 517–85.
- [5] Johnson WB. 1978. A new gutta-percha technique. *J Endod*, 4: 184–8.
- [6] Tulsa Dental Products. 1988. Thermafil Endodontic Obturators. Directions for the use of Thermafil.
- [7] Goracci G, Cantatore G & Maviglia P. 1992. Thermafil: un nuovo sistema per l'otturazione canalare. *Dent Cadm*, 60: 13–48.
- [8] Moraes IG, Betti LV & Santa Cecília M. 1995. Marginal leakage in retrograde filling done with two experimental materials. *J Dent Res*, 74: 805.
- [9] Santa Cecília M, Moraes IG, Freitas SFT, Pereira AJA & Marques ALV. 1999. Selagem apical propiciada pela técnica Thermafil em canais retos e curvos. *Rev Bras Odontol*, 56: 89–95.
- [10] Jaureguiberry ML. 1992. L'obturateur Thermafil. *Rev Franc Endod*, 11: 29–39.
- [11] Gençoglu N. 1993. Treatment of root fractured maxillary incisor with thermafil obturator. *Endod Dent Traumatol*, 9: 157–9.
- [12] Lipski M. 2000. Studies comparing the efficacy of root canal filling with gutta-percha lateral condensation and Thermafil obturators. *Acad Med Stetin*, 46: 317–30.
- [13] Gençoglu N. 2003. Comparison of 6 different gutta-percha techniques (part II): Thermafil, JS Quick-Fill, Soft Core, Microseal, System B, and lateral condensation. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*, 96 (1): 91–5.
- [14] Chu CH, Lo EC & Cheung GS. 2005. Outcome of root canal treatment using Thermafil and cold lateral condensation filling techniques. *Int Endod J*, 38 (3): 179–85.
- [15] Kocak S, Cinar S, Kocak M & Kayaoglu G. 2008. Intraradicular splinting with endodontic instrument of horizontal root fracture – case report. *Dental Traumatol*, 5: 578–80.

[16] Anreassen JO & Hjorting-Hansen E. 1967. Intra-alveolar fractures: radiographic and histologic study of 50 cases. *Oral Surg*, 25: 414–26.

[17] Zachrisson BU & Jacobsen I. 1975. Long term prognosis of 66 cases permanent anterior teeth with root fracture. *Scand J Dent Res*, 83: 355–64.