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Case Report

Endodontic Treatment on Dilacerated Maxillary Canine with a Mesial Curvature and Apical Periodontitis

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Abstract

The aim of this paper is to describe the endodontic treatment that was done on the dilacerated maxillary canine. A 34- year-old female patient with moderate pain in upper maxillary. Necrosis and chronic apical abscess was diagnosed. The endodontic treatment was done in two sessions. On the clinical and radiographic control evaluation at the 4th and 8th month the patient remained asymptomatic, the radiograph showed a decrease in the periapical radiolucency zone. Endodontic treatment on dilacerated maxillary canine with a mesial curvature of 98 degrees and radio of 3.97 mm was effective to solve the apical pathology.

Keywords: *Maxillary Canine; Endodontic Treatment; Dilaceration*

Introduction

The term dilaceration is defined as a malformation characterized as a deviation from the root of a tooth from the normal axis of its crown, which could be caused by a lesion during dental development, angled or deformed roots are included [1]. Thus, a tooth is considered dilacerated only if it possesses a 90-degree angle or greater along the axis of the tooth or root [2]. To know the angle and radius of the curvature, as well as its clinical application Schneider [3] and Pruett., *et al*. [4] determined a method. The curvature was classified as linear, moderate and severe, according to its radio, the curvatures are divided in three sizes; minor: severe curvature; intermediate: moderate curvature; and major: smooth curvature. Consideration of the angle and radio curvature before or in the course the endodontic treatment (working length) would help prevent accidents and complications during instrumentation use. Furthermore, it will help predict the results of the treatment. The aim of this clinical case was to describe the endodontic treatment that was performed on the maxillary canine with a mesial curvature of 98 degrees, radius of 3.97 mm and apical periodontitis.

Case Report

A 34-year-old female patient was referred to the Endodontic Clinic of Universitary Center of Los Altos – University of Guadalajara, apparently healthy. The reason of her consultation was mild pain, which had started three months before in her maxillary canine spreaded to the infraorbital region. The patient denied having any allergies or disease. She claimed being under an orthodontic treatment approximately four years ago.

According to the clinical exploration, it was observed that the maxillary canine had been provisionally restored, active intermittent sinus tract. Sensibility negative, periapical palpitation and percussion were positive. In the radiographic interpretation, a large canal was observed, an area with radiopacity was observed on the apical third without continuity of the apical periodontal space, lateral radiolucent zone of approximately 5 mm diameter and lack of lamina dura bone (Figure 1A). With clinical-radiographic information; chronic apical

abscess and necrotic pulp was diagnosed. therefore, with informed consent and clear explanation of the procedure to be performed, the endodontic treatment was done in two sessions.

First session

With sterile instruments, articaine 1:100,000 was applied (Medicaine, Septodont, France) by local Infiltration. Absolute isolation was achieved with a dental dam (Hygenic Non Látex, FlexiDam, USA) and clamp # 2 (Hu-friedy, Germany). Access was performed with high speed handpiece (Pana-Max PLUS, NSK, Japan), using a carbur bur# 2(Jet SDS Kerr, Mexico) and endo- Z (Dentsply, Maillefer, Switzerland) with water spray irrigation. The root canal access was identified with an endodontic explorer DG-16 (Hu-friedy, Germany). Permeability was achieved with file #10 flexo-file (Dentsply, Maillefer, Switzerland). Compensation was performed with Gates Glidden burs #4 (VDW, GmbH, Germany). Irrigation was done with 5.25% sodium hypochlorite (NaOCl).

The working length was obtained with Raypex 6 (VDW, GmbH, Germany), which was not confirmed with a radiograph. With the external clip placed over the labial mucosa of the patient, a K file #15 (Dentsply, Maillefer, Switzerland) was introduced and connected to the file-supporter. The position of the apical foramen was identified in the moment the localizer screen marked the position of 0.0 (red bar). The file was readjusted until the screen indicated -1.0 mm (green bar). It remained connected for five seconds to stabilize the reading and therefore it was considered correct. The biomechanical instrumentation was done with Reciproc system #25 and #40 (VDW, GmbH, Germany) throughout the working length, 5 ml of 5.25% NaOCl was used for irrigation, which was activated with an endodontic ultrasonic tip #30 (Mani, Japan). At the end, 3 ml of 0.9% sodium chloride (CS, Baxter, Mexico) was used for irrigation, and it was dried with paper points #40 from Reciproc system (VDW, GmbH, Germany). The root canal was medicated with calcium hydroxide paste applied with lentulo #35 (Dentsply, Maillefer, Switzerland) and provisional obturation with cavit-G (3M Espe, Germany).

Second session

After seven days, the patient was asymptomatic, the temporary restoration was removed with 10 ml of 0.9% sodium chloride (CS, Baxter, México), intracanal medication was withdrawn with file K#40 (Dentsply, Maillefer, Switzerland), at the end 3 ml of EDTA (17%) was irrigated (Ultradent, USA) and 5ml of 0.9% sodium chloride (CS,Baxter, Mexico). The root canal was dried with paper point #40 from Reciproc system (VDW, GmbH, Germany) and master cone radiography was obtained with gutta-percha cone #40 from Reciproc system (VDW, and GmbH, Germany). The radiograph showed the position of the master cone in with pronounced curvature towards mesial (Figure 1B). The obturation of the root canal system was done with gutta-percha #40 (VDW, GmbH, Germany) and sealer Sealapex (Sybron Endo, Kerr, USA) using Tagger's hybrid technique. It was restored with photopolymerizable resin (TetricN-Ceram, USA), and a final radiograph was obtained, observing uniform obturation from a dilacerated single canal, plus the sealing of an apical accessory foramen (Figure 1C).

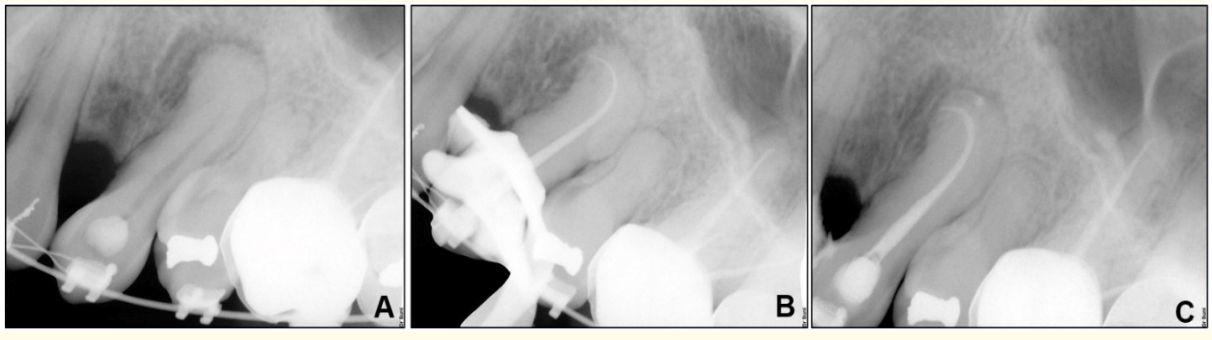

Figure 1: *Initial X-ray of the maxillary canine (A), cone test radiography showing the curve (B), final obturation and sealing of apical accessory foramen (C).*

Because of the above mentioned, it was decided to establish the curvatures angle and radius, for which Schneider and Pruett methods were respectively used. To measure the angle of the curvature, a line was traced in parallel to the longitudinal axis from the root canal to the curvature deviation (point A). A second line was traced from the apical foramen (point B), until it was intersected with point A, which was denominated point X. With a protractor (Scribe, Mexico), the angle formed between the two lines was measured (point X), obtaining 98 degrees (Figure 2A). To determine its radius, a line was traced in parallel to the longitudinal axis of the root canal (point A) and another from the apical foramen (point B), until it crossed with the point A (point X). With a geometric compass (Scribe, Mexico), a circle was drawn from this point touching both tangential lines, obtaining a radius of 3.97 mm (Figure 2B).

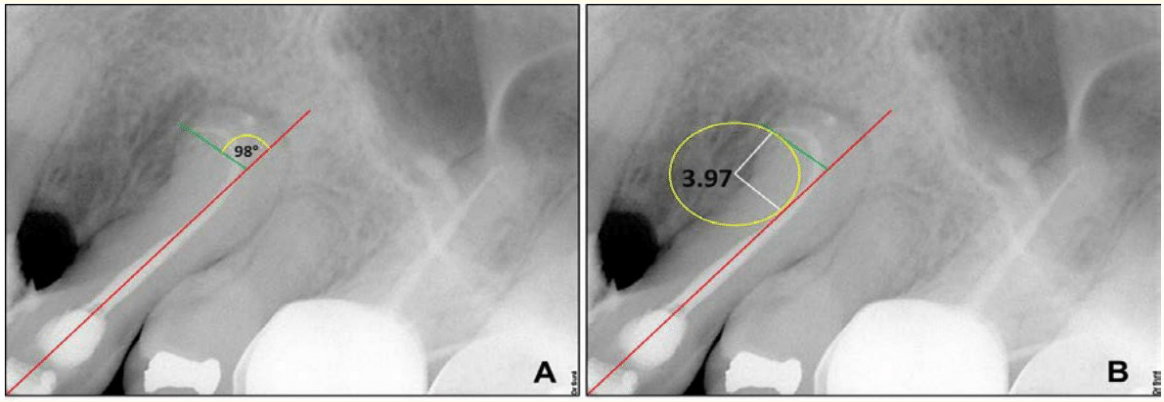

Figure 2: *Angle of the curve of 98 degrees (A) and radius of the curve of 3.97 mm (B).*

Clinic-radiographic control performed after 4 months, the patient remained asymptomatic and free of sinus tract. Radiographic evaluation revealed that the periapical radiolucency decreased approximately 3 mm, however the adjacent structures showed lamina dura, absence of widening of periodontal space and no pathologic alterations (Figure 3A). 8 months later, the patient remained asymptomatic, with absence of sinus tract and periodontal alterations. Radiographically, the radiolucency zone was reduced, as well as the adjacent structures of lamina dura, without any thickening between the periodontal space, nor adjacent pathologic alterations (Figure 3B).

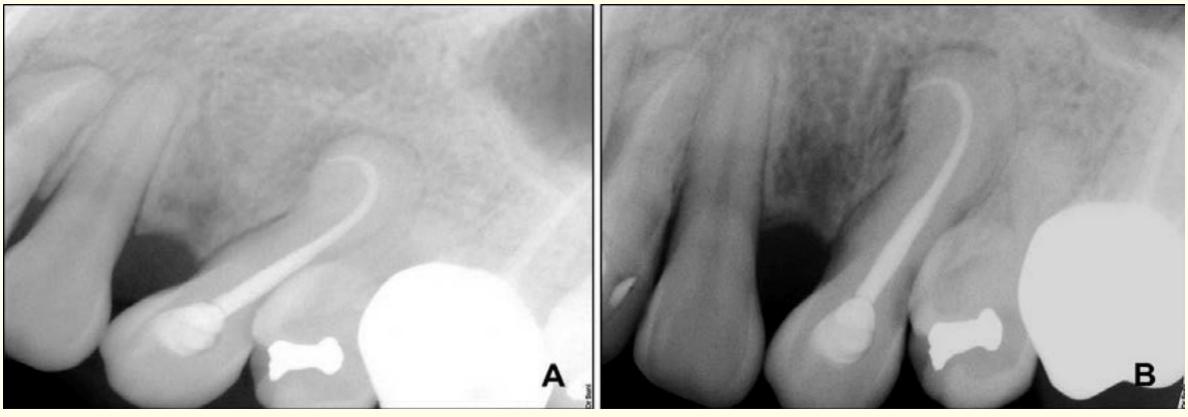

Figure 3: *Radiographic control at 4 months (A) and 8 months (B).*

Discussion

There are theories that explain the causes of root dilaceration, attributing it to diverse factors. With what was observed on this canine, it's possible that Schroder's would be the best theory to explain the cause of the mesial curvature of 98°. This theory considers that the deviations of the root directions are caused by the direction that the blood vessels follow, and that the majority of times is towards distal; notwithstanding, the dental vascular system has enough strength to modify the location of the apical foramen, due to its nutritional requirements [5]. Perhaps in this case, it changed the position towards mesial. Nevertheless, it is also possible that, due to the orthodontic movements and bone resorption/apposition, there could exists an incidental modification on the tooth or the blood flow direction, which forced to change the position of the apical foramen towards mesial.

The dilaceration can be seen in the initial x-ray, however, in this dilacerated canine it was not observed. Only loss of canal continuity was seen in the apical third, lateral radiolucent zone that could suppose a lateral canal. In the working length, the curvature wasn't observed, and even though it is the first recognition of the anatomy of the root canal system, in the present case, the working length was obtained with the electronic foramen locator (EFL) (Raypex 6), in virtue of some studies [6,7] showing that the electronic working length (EWL) is more accurate than the radiographic working length (RWL); this is own to the working principle of the EFL, which locates the accurate position of the apical foramen (AF), not as in the RWL, which is determined by the radiographic apex.

In this canine, the accuracy of the Raypex 6 was demonstrated, since the position of the AF was towards mesial. Other studies have been made in which the endodontic treatment was performed exclusively with EWL, and the employment of EFL was reliable [8]. The pronounced curvature of the canine towards mesial was observed until the master cone radiography was performed, and as mentioned before, it wasn't observed in the initial radiograph, possibly due to the angle of the orthoradial radiographic taking [9]. Likely, it's also because when the dilaceration is towards vestibular/oral or palatal/lingual, the x-ray beam goes through the deviated portion of the root in a more or less parallel direction, which makes it imperceptible in the radiographic image; therefore, in case that a RWL was obtained, the dilaceration would be appreciated at the second phase of the treatment; however, the employment of EFL has demonstrated its accuracy to determine the working length [8,9].

The obturation with Tagger's hybrid technique makes the gutta-percha generate a uniform, homogeneous mass of filling material, with a better adaptation to the root canal walls [10]. Some studies have demonstrated that its utilization for obturation of the root canals system is superior to the lateral condensation technique, therefore in this pronounced curvature of the canine, it was achieved total and uniform sealing of the canal, including an accessory foramen [11].

In the final radiograph of the endodontic treatment of the canine, it was carried out the determination of the angle and radius of the curvature with the Schneider method [3] and Pruett., *et al*. [4], which gave as a result 98° and 3.97 mm respectively. Both methods are simple, reliable and applicable to the clinical.

The patient was asymptomatic and with absence of sinus tract and periodontal alterations at the clinical-radiographic control after 4 and 8 months. In the radiographic assessment, it was observed decrease of the radiolucent periapical zone, presence of lamina dura, with no thickening of the periodontal area, not adjacent pathologic alterations.

Conclusion

The endodontic treatment on this dilacerated maxillary canine with a curvature of 98º and radius of 3.97mm is a rare case, due to the mesial direction and severe curvature. Therefore, the correct clinical application of biomechanical and biological principles contributed in the dental structure conservation and also the satisfactory resolution of the apical pathology that the patient presented.

One of the key points on diagnosis and treatment of dilacerated canine is the identification of the angle and radius of the curvature, which can be observed in the inicial radiograph, and confirmed in the radiographic conductometry. A prior acknowledgement of the dilaceration will allow to select the instrumentation and obturation technique according to the root canal system.

Conflict of Interest

The authors declare that there is no conflict of interest in this clinical case and that it was carried out in the Post-graduate clinic of Endodontics of the University Center of Los Altos, University of Guadalajara.

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