Endodontic treatment of a 36-mm long upper cuspid: clinical case report

Tratamento endodôntico de canino superior medindo 36 mm de comprimento: relato de um caso clínico

Abstract

Purpose: To report a clinical case of a 36 mm long upper cuspid submitted to root canal treatment, with emphasis on the alternative technique employed.

Case description: A 32 years old, male patient had suffered subluxation of teeth 12 and 13 and coronal fracture involving enamel and dentin, as well as pulp exposition, of tooth 14 because of a motorcycle accident. The man was given dental assistance and a semi-rigid splinting of teeth numbers 12 and 13 was carried out followed by the root canal treatment in a single visit on tooth no. 14. At 30-day follow-up pulp necrosis was detected in teeth 12 and 13 and the root canal treatment was implemented. The tooth 13 was 36 mm long and since the longest possible file (31 mm) was already in use, the cervical limit of the access cavity was considered as the reference point.

Conclusion: This technique not only provided adequate disinfection, preparation and filling of the root canal, but it also allowed preservation of the remaining tooth structure.

Key words: Anatomy; cuspid; dental pulp cavity; endodontics

Resumo

Objetivo: Descrever o tratamento endodôntico de um canino superior medindo 36 mm de comprimento, mostrando a técnica empregada no preparo do canal radicular e obturação.

Descrição do Caso: Paciente do sexo masculino, com 32 anos de idade, sofreu subluxação dos dentes 12 e 13 e fratura coronária envolvendo esmalte e dentina, com exposição pulpar do dente 14, devido a um acidente de moto. No atendimento de urgência, foi realizada a contenção semirrígida dos dentes 12 e 13, seguida da endodontia em sessão única do dente 14. Trinta dias após, foi diagnosticada necrose pulpar dos dentes 12 e 13 e sua endodontia foi, então, iniciada. O comprimento aparente do dente 13 foi estabelecido em 36 mm e como o instrumento mais longo que dipomos no mercado possui 31 mm, o limite cervical da cavidade de acesso foi usado como bordo de referência.

Conclusão: Além de garantir uma correta sanificação, modelagem e obturação do canal, esta técnica também permitiu a preservação da estrutura dental remanescente.

Palavras-chave: Anatomia; cavidade pulpar; endodontia

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Introduction

Dental anatomy studies report different mean lengths for different tooth types. Upper cuspids, for example, have been associated with normal mean lengths varying from 25 to 27.2 mm (1-4). In some cases, upper cuspids may reach unusual lengths, above 30 mm. Some examples already reported include lengths of 33.5 mm (2), 39 mm (5), 39.5 mm (6), 41 mm (7), and even 47 mm (8). Bjorndal et al. (9) studied 51 maxillary cuspid teeth from males between the ages of 17 and 21 years. The longest cuspid found was 33.3 mm long while the mean length of the sample was 27.3 mm.

A 39.5 mm long maxillary cuspid was presented by Weine (6) in a case report in 1986. It had been removed from a heavy-set white man who was about 1.83 cm tall. The authors had suggested that increased tooth may be associated with a population trend toward increased average height. At that time, it was described as the longest human tooth ever reported. But in 1990 Wilkie et al. (10) presented a longer cuspid measuring 41.0 mm that was removed from a 23-year-old with woman. The pacient was 1.53 cm tall, demonstrating that tooth length and physical stature are not necessary related.

In 1990, Marachi et al. (8) tried to relate longer cuspids with congenital cataracts. They reported cases of cuspids between 41.5 and 47 mm long in a sister and brother that had congenital cataracts, but this was a rare finding.

Although such measurements are restricted to the study samples, these means usually help to support treatment planning and delivery. However, in clinical practice, it is relatively common to face anatomical characteristics that differ from those described in the literature.

Treatment becomes more complex in such cases, because there are no endodontic instruments longer than 31 mm commercially available, at least in Brazil. The use of alternative treatment techniques thus becomes necessary, with the aim of guaranteeing a successful endodontic treatment and respecting the biological and mechanical principles of endodontics.

The present article reports the case of a patient with a 36-mm long upper cuspid submitted to root canal treatment, with an emphasis on the alternative technique employed in root canal preparation and filling.

Case description

A 32-year-old male patient was referred to a dental clinic after trauma caused by a motorcycle accident. At the clinic, emergency treatment was provided. The patient's medical history was unremarkable and he was already immunized against tetanus. Extra-oral examination revealed abrasions and some lacerations which were cleaned and sutured. Intraoral examination revealed subluxation of teeth numbers 12 and 13, and coronal fracture involving enamel and dentin, as well as exposed pulp on tooth 14. A radiographic examination showed no evidence of alveolar bone fracture.

Emergency treatment was carried out and consisted of a semi-rigid splinting of teeth 12 and 13 followed by the root canal treatment in a single visit on tooth 14.

At thirty-day follow-up, a color change was observed in teeth 12 and 13, to a slightly darker shade and pulp tester was negative. Another periapical radiography was performed, revealing an image compatible with thickening of the periodontal ligament. A diagnosis of pulp necrosis was than established for teeth 12 and 13. The radiographic examination (Fig. 1) revealed an apparent length of 26 mm for tooth 12 and of 36 mm for tooth 13.

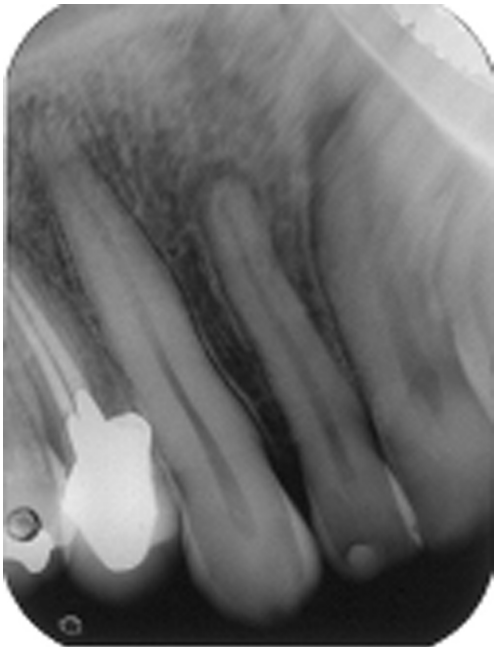

Fig. 1. Baseline radiograph.

Coronal access

Following the delivery of local anesthesia (mepivacaine 2%, Mepiadre, DFL) and isolation with rubber dam coronal access in a lozenge shape was made through the palatal enamel with a diamond bur size 1012 (KG Sorensen, São Paulo, Brazil) in tooth 12 and 13. The access to pulp chamber was carried out on the palatal face of tooth 13, at 2 mm from the cingulum in incisal direction, with a round carbide bur size 1 (KG Sorensen, São Paulo, Brazil) at high-speed rotation. An Endo Z bur (KG Sorensen, São Paulo, Brazil) was used inside the pulp chamber at high-speed rotation, creating divergent walls in the access cavity.

After performing the endodontic assessments the pulp necrosis was confirmed visually.

Exploration

Root canal was explored using 2.5% sodium hypochlorite solution, with a 31-mm long, pre-curved, K file size #10 (Dentsply/Maillefer, Ballaigues, Switzerland) without

silicon stop. Initial insertion was carried out with slow movements towards the tooth apex, and was interrupted when the instrument handle reached the incisal edge.

Root canal preparation

Root canal preparation was carried out under irrigation with 2 mL of 2.5% sodium hypochlorite (Biodinâmica Química e Farmaceutica Ltda., Ibipora, Brazil) each time the instrument was changed. The crown-down technique (11,12) was performed using 31-mm K files, starting at size #70, followed by sizes #60, #55, #50, #45, #40, and #35. The last file reached 31 mm, using the incisal edge as reference point. At this moment, cervical preflare was carried out with Gates-Glidden bur sizes #2 and #3.

Radiographic measurement showed a 5-mm distance between the file tip and the radiographic apex, confirming a root canal length of 36 mm for tooth 13. Since the longest possible file (31 mm) was already in use, the cervical limit of the access cavity was considered as the reference point. A new radiograph was taken, showing a distance of 1.5 mm between the file tip and the radiographic apex. Therefore, taking the cervical limit of the access cavity as the reference point, it was possible to establish a distance of 32.5 mm to the radiographic apex and a working length of 31 mm. These were the distances taken into consideration throughout the treatment. Apical preparation was carried out with K file sizes #35, #40, and #45, respectively. Irrigation was performed alternating 2.5% sodium hypochlorite and 17% EDTA trisodium solution (Biodinâmica Química e Farmaceutica Ltda., Ibipora, Brazil) followed by aspiration each time the file was changed. At the end of apical preparation, the canal was dried using absorbent paper points size #45.

Intracanal medication

Calcium hydroxide dressing was employed to enhance disinfection of dentinal tubules. The paste was produced by mixing pure powder (pro-analysis) and distilled water. The paste was vigorously mixed on a glass plate, until reaching the ideal consistency. The dressing was inserted into the root canal using a Lentulo spiral filler (Dentsply/Maillefer, Ballaigues, Switzerland), in small portions, until the root canal became adequately filled. The pulp chamber was cleaned and sealed with glass ionomer cement.

Root canal filling

Fifteen days later, the calcium hydroxide dressing was removed using a K file size #45 under irrigation with sodium hypochlorite and 17% EDTA solution. The canal was dried with absorbent paper points.

For root canal filling, a master gutta-percha point longer than 36 mm was created using two size #45 gutta-percha points, which were mixed and rolled on a heated glass plate. The point was adjusted to working length and a radiograph was taken (Fig. 2), showing a 1.5-mm distance between the gutta-percha point tip and the radiographic apex.

AH Plus cement (Dentsply/Maillefer, Ballaigues, Switzerland) was prepared according to manufacturer's instructions and inserted into the root canal together with the gutta-percha point to working length. Tagger's hybrid technique (13) was used with lateral condensation of accessory gutta-percha points and thermatic compaction of filling material using a McSpadden compactor #50 (Dentsply/Maillefer, Ballaigues, Switzerland). Excess filling material was removed using a heated gutta-percha condenser, and the pulp chamber was cleaned and restored using glass ionomer cement. A final radiograph was taken for treatment assessment (Fig. 3). A 6-month recall radiograph showed complete healing.

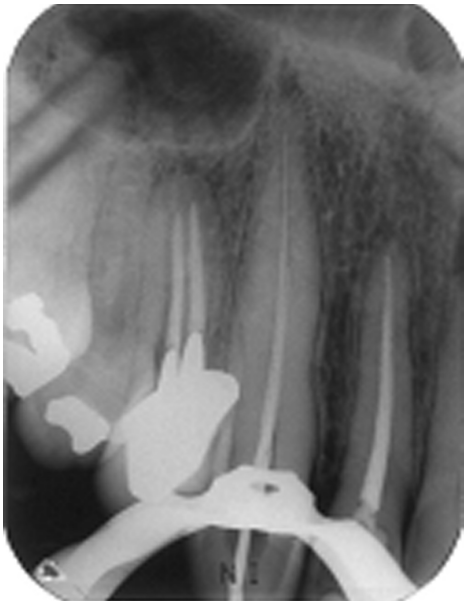

Fig. 2. Radiograph showing position of the master gutta-percha cone at real working length.

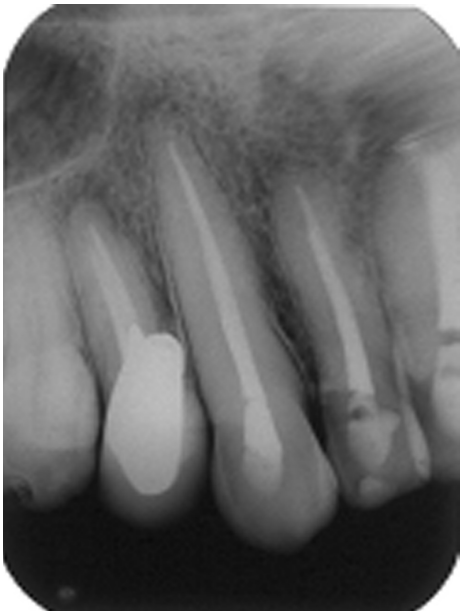

Fig. 3. Post-treatment radiograph.

Discussion

Instrumentation of upper cuspids longer than 32 mm long is extremely difficult because of the size of the instruments commercially available. In spite of the difficulties faced in clinical practice, the present discussion will focus on the characteristics of the alternative treatment technique used in this particular case, which allowed preservation of the crown and may therefore be useful to treat other similar cases.

It is widely known that upper cuspids are the longest teeth in the human dental arch. Cuspids are flattened in the cervical region and should be flared to allow adequate instrumentation (14). Also, they present only one wide canal with higher buccopalatal and lower mesiodistal dimensions, a feature that facilitates endodontic treatment. On the other hand, cuspids may have unusual lengths, above 31 mm, which imposes technical difficulties and therefore requires creativity on the part of the professionals so as to avoid crown wear.

The root canal length observed in the present case is in accordance with the findings of Zmener et al. (15), who examined 280 human upper teeth extracted at several Argentinean hospital services and observed that 13.21% of the teeth were longer than 31 mm, with higher lengths in teeth with curved canals. Studies such as that of Zmener et al. (15) leave no doubt that professionals should be ready to deal with such cases in the clinical practice, emphasizing the need for good radiographs before endodontic treatment.

In the present case, a conservative technique was employed because the tooth presented an intact crown, with no need for prosthetic rehabilitation. Therefore, instead of damaging the crown in order to reach the ideal working length, the authors decided to change the traditional reference point, adopting the cervical limit of the access cavity as reference.

The technique however required a more complex chemical/mechanical preparation, due to the difficulty in holding the instrument handle and using oscillatory or rotary NiTi instrumentation. Nevertheless, the treatment approach ensured that all root canal walls were instrumented. The working length was adapted and then established at 1.5 mm short of the radiographic apex, differently from the widely validated distance of 1.0 mm (3), but was considered to be adequate.

In order to compensate for possible limitations in the root canal treatment resulting from the obstacles faced during preparation, a 2.5% sodium hypochlorite solution was used, with a greater concentration of active chlorine when compared with the concentration of 1% (2).

Calcium hydroxide dressing was used to enhance disinfection of dentinal tubules (16,17). During root canal filling, it was necessary to customize a longer-than-usual master gutta-percha point. The use of a rolled gutta-percha point was therefore selected, a well-established technique, commonly referred by specialists (18). Finally, the use of gutta-percha thermoplasticisation using Tagger's hybrid technique (13) assured filling material homogeneity throughout the root canal.

It is important to point out that Dentsply/Maillefer (Ballaigues, Switzerland) produces the Vetinox series of endodontic instruments, designed for veterinary use, with higher lengths, reaching 40 and even 60 mm. These instruments were used in Argentina by Zmener (4) while treating a 39-mm long upper canine. In Brazil, however, the Vetinox line is very difficult to acquire and therefore their use was not considered.

After seeing this clinical case in association with other dental anatomy studies data, the availability of longer endodontic instruments in the market becomes evident. The cuspids show length measures that can reach the maximum measure of the longer endodontic instrument available or even go beyond. Therefore situations of extreme length as the cases reported (5-7) can occur and in case it is not possible to use another alternative technique it runs the risk of having to wear the coronary structure or even to lose a dental element.

In conclusion, the use of an alternative reference point, located at the cervical limit of the access cavity, proved to be an excellent approach in this case. The alternative technique not only provided adequate disinfection, preparation and filling of the root canal, but it also allowed preservation of the remaining tooth structure. Therefore, it is strongly suggested that the technique herein described could be considered in the endodontic treatment of cuspids with lengths above 31 mm.

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