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Endodontic treatment of 32 mm long upper canine: Two Case Reports

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Abstract:
Background: *Permanent maxillary cuspid can present with an unusual length exceeding 31 mm. These clinical case reports describe two 32 mm long upper canines scheduled for root canal treatment, with emphasis on the alternative technique employed.*
Case description*: Two middle aged group patients suffering from pain in the maxillary right cuspid and premolar region reported to the Department of Conservative Dentistry & Endodontics. Pulp necrosis was diagnosed in 13 in both cases and root canal treatment was implemented. During root canal treatment it was found that the working length of 13 was 32 mm long and since the longest possible file (31 mm) was already in use, a point at lower border of cingulum i.e. almost 5 mm cervical to the cusp tip 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.*
Keyword: *Root canal anatomy; Maxillary cuspid; Root canal treatment.*

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I. INTRODUCTION

Differences in size and morphology of the tooth are of interest to all dental practitioners. Dental anatomy studies report different average lengths for different types of tooth. Upper cuspids, for example, have been associated with normal mean lengths varying from 25 to 27.2 mm[1]. Maxillary canines may however reach unusual lengths above 30 mm.

Black' documented measurements of human teeth and noted that the average length of maxillary canines was 26.5 mm, with his longest example being 32.0 mm[2]**.** Bjorndal and coworkers studied 51 maxillary canines from males between 17 and 21 years. They found that the longest canine was 33.3 mm, with the average length being 27.3 mm[3]**.**

A number of studies already reported lengths of 39 mm[4], 41 mm[5], and even 47 mm[6]. A 39.5 mm long maxillary canine was presented by Weine[7] in a case report in 1986. It had been removed from a man about 1.83 cm tall. The authors had suggested that increased length of the 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. However in 1990 Wilkie et al.[8] presented a longer canine measuring 41.0 mm that was removed from a 23- year-old white woman. The patient was 1.53 cm tall, demonstrating that tooth length and physical stature are not necessary related.

In 1990, Marachi et al.[6] tried to correlate longer canines with congenital cataracts. They reported cases of canines 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 vary 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. The use of alternative treatment techniques thus becomes necessary, with the aim of ensuring a successful endodontic treatment and respecting the biological and mechanical principles of endodontics.

II. CASE REPORT: NO - 1

A 38 year old male reported to the Department of Conservative Dentistry & Endodontics with chief complain of severe pain in the maxillary right canine. Evaluation by the attending faculty member resulted in the diagnosis of irreversible pulpitis. An intra-oral periapical radiograph showed thickening of the periodontal ligament space around the apex of the tooth. The radiographic examination (Figure 1(i)) revealed an apparent length of of 31 mm for tooth 13.

Coronal access: Following the delivery of local anesthesia (2% lignocaine and 1:100,000 epinephrine) and isolation with rubber dam coronal access was made through the palatal enamel with a round diamond point in tooth 13. The access to pulp chamber was carried out on the palatal surface 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 5.25% sodium hypochlorite solution, with a 31-mm long, pre-curved, K file size #15 (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. Radiographic measurement showed 1.5 mm distance between the file tip and the radiographic apex, providing the estimated root canal length of 32 mm for tooth 13. Since the longest possible file (31 mm) was already in use, a point at lower margin of cingulum which is almost 5mm cervical to the cusp tip was considered as the reference point. A new radiograph was taken, showing a distance of 0.5 mm between the file tip and the radiographic apex (Figure 1(ii)). Therefore, taking a point at lower margin of cingulum which is a stable reference point, 32mm the working length is also established by Root ZX Mini apex locator (J. Morita, Tokyo, Japan).

Root canal preparation: Root canal preparation was carried out under irrigation with 5.25% sodium hypochlorite each time the instrument was changed. The step back technique was performed using 31-mm K files, starting at size #15, followed by sizes #20, #25, #30, #35 with #40 as the Master Apical File to the reference point. Then # 45 file was taken and its WL was set 1 mm short of the full WL, and it was carried down the canal to the new shortened depth. The same process was repeated with subsequent instruments again shortened by 1.0 mm from the MAF till #60. Copious irrigation with 5.25% sodium hypochlorite (NaOCl) followed by 17% EDTA was carried out during instrumentation phase. At the end of apical preparation, the canal was dried using absorbent paper points size #40**.** Calcium hydroxide dressing was employed to enhance disinfection of dentinal tubules.

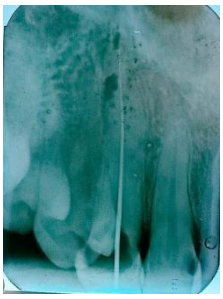
Root canal filling: Fifteen days later, the calcium hydroxide dressing was removed using a K file size # 40 under copious irrigation with sodium hypochlorite and 17% EDTA solution. The canal was dried with absorbent paper points. AH Plus cement (Dentsply/Maillefer, Ballaigues, Switzerland) was prepared according to manufacturer's instructions and inserted into the root canal together with the #40 gutta-percha point to working length. Lateral condensation of accessory gutta-percha points was done. Excess filling material was removed using a heated gutta-percha condenser. A radiograph was taken for treatment assessment (Figure 1(iii). Subsequently, the pulp chamber was cleaned and restored with composite.

Figure 1: (i) Pre-Operative Radiograph, (ii) Working Length Radiograph , (iii) Obturation Radiograph

CASE REPORT: NO- 2

A 47 year old female reported with pain in the right maxillary canine. The tooth was sensitive to percussion and palpation and it revealed no response to cold test. On careful examination of the preoperative intra oral periapical radiograph, a carious exposure to pulp and a very long root with an apparent 32 mm tooth length was revealed (Figure 2(i)). Based on clinical and radiographical findings the tooth was diagnosed with necrotic pulp. Access cavity preparation was done followed by working length determination both by radiograph (Figure 2 (ii)) and Root ZX Mini apex locator. The final working length was found to be 32 mm. Reference point was determined following the procedure mentioned above. Bio-mechanical preparation along with copious irrigation with 5.25% NaOCl and 17% EDTA was done followed by obturation (Figure 2 (iii))

2 (i)



2 (ii)

2 (iii)

Fig 2: (i) Pre-Operative Radiograph, (ii) Working Length Radiograph , (iii) Obturation Radiograph

III. DISCUSSION

Biomechanical preparation of upper canines longer than 31 mm long is generally considered difficult because of the size of the instruments commercially available. So, the present discussion focuses on the supplementary treatment technique used in this particular case, which allowed preservation of the crown and may therefore be useful to treat other similar cases.

The root canal length observed in the present cases concurs with the findings of Zmener et al.[9], who examined 280 human upper teeth extracted at several Argentinean hospital services and found 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.[9] leave no doubt that professionals should be ready to deal with such cases in the clinical practice with special focus on the need for good radiographs before endodontic treatment.

In the present cases, 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 traditional reference point was changed to a point at lower margin of cingulum which is about 5mm cervical to the cusp tip and it is also a stable reference point. 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. After seeing this clinical case in collaboration with other dental anatomy studies data, the need for availability of longer endodontic instruments in the market becomes evident. The canines show root canal length measures that can reach the maximum measure of the longer endodontic instrument available or even go beyond. Therefore situations of extreme length 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.

IV. CONCLUSION

In conclusion, the use of an alternative reference point, located at lower margin of cingulum that is about 5 mm cervical to the cusp tip and is a stable reference point, 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.

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