

## Endodontic treatment of a mandibular canine with two roots

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### Abstract

Lower canine is a tooth with a robust, long root and very good implantation, making it a valuable abutment tooth for any type of prosthetic treatment. In order to treat it conservatively and to prevent its loss from the dental arch it is necessary to accomplish a correct and complete endodontic treatment, which involves knowledge of all its morphological variation. The mandibular canine usually presents one root with a single large canal centrally located. The possible anatomical variations are the existence of a single root with two canals and of two different roots, each having a canal. The incidence of lower canines with two roots is usually low, as described in various studies, but their presence in everyday practice shows that the clinician must consider them if he wants to prevent dental endodontic treatment failure. This article presents a relatively rare case of a patient whose right mandibular canine has two roots and two canals. Although the frequency of mandibular canines with two roots is very low, we must not forget that we can deal with such cases, which can obviously occur even in patients in our country, as the ones described in foreign specialty literature.

**Keywords:** mandibular canine, endodontic treatment, root anatomy.

### Introduction

Canine is called the “cornerstone” of the mouth because of its location, which reflects its dual function to complement the incisors and premolars during mastication. These teeth are able to withstand increased lateral pressure during the act of mastication, thus being an important abutment for any prosthetic reconstruction.

In order to preserve as much as possible these valuable teeth they should benefit from properly performed root canal treatment. The root canal treatment is a complex procedure, so it is imperative that each clinician know the anatomy of the dental structures and consider it in endodontic therapy, since many morphological variations can occur at this level [1]. The endodontic treatment failure may be due to persistent infection on the canals, incomplete mechanical treatment, incomplete filling or lack of filling of one root canal that remained undetected. The goal of endodontic treatment is to eliminate the infection inside the root canal and to prevent its recurrence [2], which can be achieved through a proper instrumentation.

There are a couple of studies published about the anatomical variations of mandibular canines in various racial categories. Usually, the basic anatomy of these teeth comprises one root and one large canal centered through its axis, but approximately 15% of the cases reported the presence of two canals in the lower canine; very rarely was reported the presence of two different angulated roots. In these later cases, the endodontic treatment is more difficult.

### Patient, Methods and Results

Patient F.L., 59-year-old, female, came at the dental office complaining of pain in the right mandibular area. She was partially edentulous (inferior class I Kennedy) and wearing two mobile dentures with esthetic clasps. The abutments of the lower denture were 4.3 and 3.4, both covered with porcelain-fused-to-metal crowns. After the clinical examination, we indicated a full radiological investigation with panoramic (Kodak) (Figure 1) and retroalveolar (Irix) X-rays.



**Figure 1 – The periapical lesion located at 4.3.**

A periapical lesion associated with tooth 4.3 was then discovered as the cause of the pain. The retroalveolar X-ray showed the presence of two roots of the mandibular canine and an attempt of endodontic treatment, which failed (Figure 2). A second eccentric retroalveolar X-ray was done to show the length and the angulations of the roots (Figure 3). The tooth did not respond to vitality tests. We presented various treatment plan options to the patient and she decided for a fixed restoration supported by implants, instead of the lower denture. In this case, the canine has to be endodontically retreated and restored with a new crown. After the

removal of the old crown, the root-canal therapy of the canine started with the isolation of the tooth using cotton rolls and suction. The access was made using a spherical bur at high speed to remove an old filling. The pulp chamber was found open because the tooth suffered previously an attempt of a root canal treatment that did not succeed. Pulp chamber ceiling was now completely removed with a cylindrical bur at a conventional speed. At this moment, we were able to see the two orifices of the root canals (Figure 4), one buccal and one lingual, and not a single hole located on the axis of the tooth, as it is frequently the case. The presence and the orientation of the two canals were observed using two Kerr files (Figure 5), and then they were prepared in a step back technique up files number 35. The buccal root was easier to instrument. The lingual root was then opened and funneled in order to prevent packing of dentin debris and the consecutive loss of access. The procedure was made easier by precurving the instruments at the initial access.

Working length was 21.5 mm on lingual canal and 24 mm on the buccal one. At each change of instruments, the irrigations were largely made using antiseptic solutions. The canals were dried with sterile paper points. The final filling of root canals was done using a material based on calcium hydroxide and gutta-percha cones (Figure 6). We closed the access with a temporary filling material and we fixed the old crown with temporary cement.

The canals were filled up to the apex, as in a later stage of the treatment the periapical lesion necessitated surgical removal (apical resection). An "L" incision was made in the mucosa near the right canine and the muco-periosteal flap revealed the vestibular bone plate and the dehiscence at 4.3 (Figure 7). The access to the lesion was achieved using a conventional speed bur. The granulation tissue around the apexes was removed with a curette. At the end of the intervention the bone edges of the cavity were adjusted, then the flap was sutured (Figure 8).



**Figure 2 – The failure of the previous attempt of an endodontic treatment.**



**Figure 6 – The correct endodontic treatment.**

**Figure 3 – The presence of canine's two roots (4.3).**



**Figure 7 – Surgical intervention.**



**Figure 4 – The buccal and the lingual opening orifices.**



**Figure 8 – The suture of the flap.**

**Figure 5 – The direction of the two root canals.**



The root of the mandibular canine is the longest in the mandibular arch. Canine guidance is considered the most physiologic of all occlusal relationship because it protects the teeth from wear and tends to prevent bruxing in most persons who are likely to brux only occasionally. One of the most important goals in prosthetic rehabilitation is to achieve a concept of occlusal function in which the canine teeth are assigned a major control role in the excursive movements of the mandible.

The mandibular canine is slightly narrower than the

maxillary one, but its crown is as long or sometimes is longer. It usually has only one root, but sometimes the root may be bifurcated. Rarely can it have two roots. When it does, one root faces the tongue (lingual side) and the other one faces the lip (labial side).

In this case, the patient's right mandibular canine presented two distinct roots, with one root canal each. Initial radiography indicated the possible existence of these two roots, which was confirmed radiological and clinical. Precuring of instruments at initial access enabled us to trace down the lingual root wall until the tip engaged the orifice. When the two canals were located, we shaped and funneled the opening to maintain continued access. Following this procedure, the endodontic treatment could be successfully achieved on both canals. Together with the subsequent removal of infected periapical tissue by surgery, the treatment procedures aimed to avoid the extraction of this important tooth.

### Discussion

Every tooth can present anatomical variations of the roots either in number or in shape and also variations of the endocanalicular system. The presence of additional roots in mandibular anterior teeth is less frequently encountered than in case of molars [3–5]. Pineda F and Kuttler Y (1972), following a study that included radiographic examination of 7275 radicular canals, reported that mandibular canines may have anatomical variations [6]. A year later, Green D (1973) reached the same conclusion [7]. Studying the anatomy of human teeth roots, Vertucci FJ [8], Laurichesse JM *et al.* in 1986 [9] and Heling I *et al.* in 1995 [10] provided also information about the anatomical variations of mandibular canines. Green D (1955) and Kutler Y (1961) analyzed the anatomy of the endocanalicular system and reported that the presence of two roots in mandibular canines is rarely seen [11, 12].

In a study conducted by Quellet R [13], the presence of the second root in mandibular canine appears in proportion of 5% of all teeth included. A considerably lower percentage was found by Laurichesse JM *et al.* [9], which have been described that in the case of mandibular canines, the second root is found in proportion of only 1%. Making a study on 830 extracted mandibular canines and analyzing their internal anatomy, direction and number of roots, Pécora JD *et al.* found a rate of 1.7% of mandibular canines with two roots, featuring two canals [14]. D'Arcangelo C *et al.* [15] reported two patients presenting two roots at the mandibular canine. A similar case was reported by Heling I *et al.* [10].

Although studies show that the percentage of mandibular canines with two roots encountered in dental practice is relatively small, it is important to consider the possibility of existence of two roots with two canals before starting any endodontic treatment for this tooth. If we omit the presence of any additional root and we fail to treat and fill it, we will create a source of

infection which will compromise the conservation of the tooth [16].

### Conclusions

The mandibular canines seldom present endodontic problems because of their large volume. The only situations that can create difficulty are the presence of two canals or the unusual occurrence of two roots, but this is even rarer. Still, it is very important to know the anatomy of the teeth, but also the morphological variations that can occur in order to achieve successful endodontic treatment and to avoid the loss of any tooth requiring such treatment. The anatomy of the root canal system influences the endodontic procedures and directly affects tooth's prognosis.

In cases where usual retroalveolar X-rays did not show the presence of several roots, although we clinically suspect this, the need to take an eccentric X-ray is obvious. Undetection of all roots and of all radicular canals will involve the lack of filling of the entire endodontical space, which will lead to endodontic treatment failure and finally to the loss of the tooth.

The foreign specialty literature mentions that the endodontic treatment of mandibular canines should be done taking into account the possibility of the existence of two roots with two canals. As shown in the case presented here, such anatomical variations can also occur in the Romanian population and justifies the need for some large-scale studies.

### References

- [1] Nair PN, Sjögren U, Krey G, Kahnberg KE, Sundqvist G, *Intraradicular bacteria and fungi in root-filled, asymptomatic human teeth with therapy-resistant periapical lesion: a long-term light and electron microscopic follow-up study*, J Endod, 1990, 16(12):580–588.
- [2] Sjögren U, Hagglund B, Sundqvist G, Wing K, *Factors affecting the long-term results of endodontic treatment*, J Endod, 1990, 16(10):498–504.
- [3] Turner CG 2nd, *Three-rooted mandibular first permanent molars and the question of American Indian origins*, Am Phys Anthropol, 1971, 34(2):229–241.
- [4] Wheeler RC, *Dental anatomy, physiology and occlusion*, 5<sup>th</sup> edition, W.B. Saunders & Company, Philadelphia, 1974, 194.
- [5] Taylor RMS, *Variation in morphology of teeth*, Charles C. Thomas, Springfield, Illinois, 1978, 181.
- [6] Pineda F, Kuttler Y, *Mesiodistal and buccolingual roentgenographic investigation of 7,275 root canals*, Oral Surg Oral Med Oral Pathol, 1972, 33(1):101–110.
- [7] Green D, *Double canals in single roots*, Oral Surg Oral Med Oral Pathol, 1973, 35(5):689–696.
- [8] Vertucci FJ, *Root canal anatomy of the human permanent teeth*, Oral Surg Oral Med Oral Pathol, 1984, 58(5):589–599.
- [9] Laurichesse JM, Maestroni J, Breillat J, *Endodontie clinique*, 1<sup>re</sup> édition, Edition CdP, Paris, 1986, 64–66.
- [10] Heling I, Gottlieb-Dadon I, Chandler NP, *Mandibular canine with two roots and three root canal*, Endod Dent Traumatol, 1995, 11(6):301–302.
- [11] Green D, *Morphology of the pulp cavity of the permanent teeth*, Oral Surg Oral Med Oral Pathol, 1955, 8(7):743–759.
- [12] Kutler Y, *Anatomia topografica de la cavidad pulpar*. In: Kutler Y (ed), *Endodoncia práctica*, Ed. A.L.P.H.A., Mexico, 1961, 29.
- [13] Quellet R, *Mandibular permanent cuspids with two roots*, J Can Dent Assoc, 1995, 61(2):159–161.

- [14] Pécora JD, Sousa Neto MD, Saquy PC, *Internal anatomy, direction and number of roots and size of human mandibular canines*, Braz Dent J, 1993, 4(1):53–57.
- [15] D’Arcangelo C, Varvara G, De Fazio P, *Root canal treatment in mandibular canines with two roots: a report of two cases*, Int Endod J, 2001, 34(4):331–334.
- [16] Andrei OC, Mărgărit R, Dăguci L, *Treatment of a mandibular canine abutment with two canals*, Rom J Morphol Embryol, 2010, 51(3):565–568.

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