

ANATOMICAL VARIATIONS OF MANDIBULAR CANINES IN A ROMANIAN POPULATION AND RELATION TO PROSTHETIC TREATMENT

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ABSTRACT: Objective: The anatomy of mandibular canines is not always as simple as can be expected. Their morphological variations must be taken into account in order to prevent the failure of endodontic treatment. The knowledge of these anatomical variations is essential for proper root canal therapy and consequently for the long term success of subsequent prosthetic treatment. We wanted to reveal the presence of mandibular canines with two roots or two canals in the Romanian patients, roots and canals that if remained undetected can be a cause of tooth extraction and failure of prosthetic treatment. Patients and method: This article presents a study on anatomical variations encountered in the mandibular canines used as abutment teeth for fixed prosthesis or mobile denture. The study was done on a sample population of 282 patients from a private practice in Bucharest. We analyzed retrospectively all the new patients that came into the office during a period of time of 3 years, from 2008-2011, seeking various types of treatment. From them, only 36 needed at least one mandibular canine as an abutment. For data processing were used software packages Epi Info, distributed by the OMS and the Data Analysis module of Microsoft Excel. Registering with Excel data on patients produced the original database from which we extracted the significant aspects of this study. The actual processing was done using the program Epi Info Analysis module specialized in performance graphs, tables and statistical tests, as well as with commands Statistical Functions and Chart by MS Excel program. Results: After implementing this study it was observed that by the number of 59 mandibular canines which required endodontic treatment, a number of 56 (95%) had a usual anatomy, while a total of three (5%) presented anatomical variations. From the total of the canines, 49% were used as abutments for removable partial dentures, 19% were used as abutment for ceramic fused to metal bridges, 15% were covered with crowns and 14% were used as abutments for overdentures with magnets. Only 3% was restored by coronary fillings. Conclusion: The results show that such anatomical variations can also occur in Romanian population as much as described in the international literature and cannot be overlooked in private practice. In Romania there are no currently available studies at the level of the population. This anatomical variation is a major risk for both endodontic and prosthetic treatment failure.

Key words: dental anatomy variation, canine, endodontics, prosthetic treatment.

INTRODUCTION

The mandibular canine is a very important tooth to be used as an abutment in any type of prosthetic treatment. The usual anatomy of the lower canine is with one root with a single large canal centrally located. The anatomical variations on mandibular canines increase the difficulty level of endodontic treatment. In order to achieve a correct obturation, it is

important to take into account the morphology of root canals and the variations of the entire canalicular system [1, 2]. In endodontics the diagnostic and treatment decisions are based on radiographic findings. Usually, the panoramic and periapical X-ray do not offer a clear information about the possible presence of two canals or two roots for the mandibular canine normally

positioned on the arch. If the mandibular canines are malpositioned and rotated, it is sometimes possible to see these variations on the radiographs taken from a parallel incidence. For example, on a young male

patient, we made a panoramic X-ray for highlighting the third molar position and we observed that both mandibular canines had two canals located in a single root (Fig. 1).

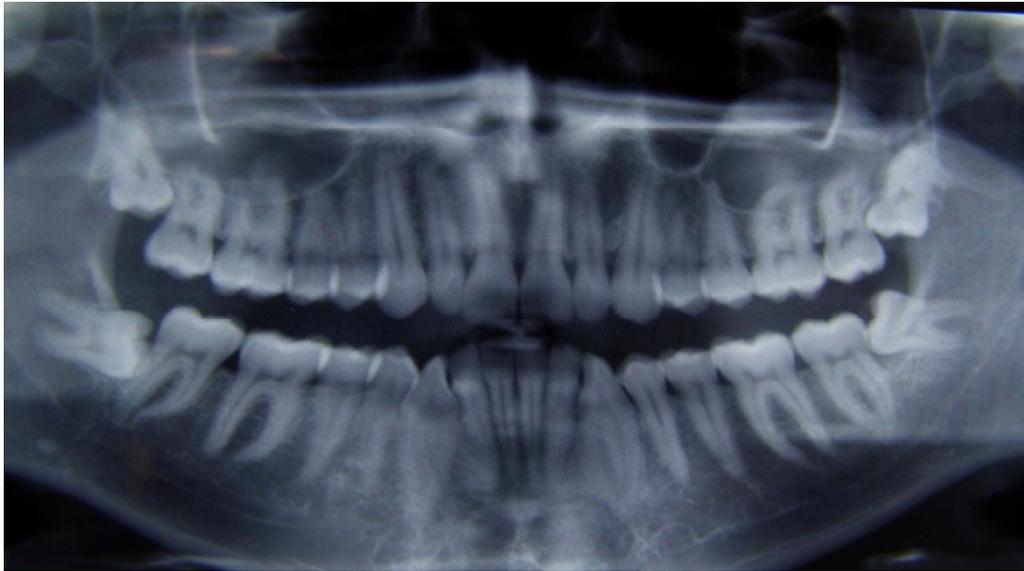


Fig. 1. Panoramic X-ray showing the two canals of each mandibular rotated canine.

Being an irreversible procedure, the radiographic exposure must be made only when it is necessary. For safety, time and money reasons, only the radiographs necessitated by the procedure were made. Their limitations required in some cases special approaches. The diagnostic radiographs made for these patients usually showed general information of root and pulp anatomy and the nature of the pathosis (pulpal, periapical, periodontal and bony lesions), but not always the real number of root canals or roots. Canal number and location are obviously essential to success. In selected cases, after clinical examination of the pulp chamber, we made additional films for identification of extracanals or roots. Varying either the vertical or the horizontal cone angulation from parallel revealed the third dimension and superimposed structures, permitting the identification and positioning of structures that lie in the facial-lingual plane. Usually, a mandibular canine root

contains a single canal and if so, it will be positioned close to the center of that root. If not, a radiograph must be made either mesial or distal because another canal may be present, especially if the instrument placed into the canal is considerably off center. Therefore, for the mandibular canines suspected of having anatomical variations, two working radiographs had to be made, one from the straight facial view and the other from either the mesial or distal view.

PATIENTS AND METHODS

We studied a group of 282 patients with various dental treatments. In this study it was followed the need for mandibular canine's endodontic treatment and the different subsequent restoration of these teeth. Of the 282 patients, only 36 required endodontic treatments on mandibular canines, the remaining 246 have followed other dental treatments (Fig.2). The average age of patients in the group that required endodontic treatment of the canines was 55.08 ± 9.78

years, for men being 56.53 ± 7.18 years and for women 54.09 ± 11 , 27 years, the sample being composed by 14 men and 22 women aged 32- 83 years. A total of 59 mandibular canines needed endodontic treatment from various reasons (30 left and 29 right). Further restoration of canines using different methods is shown in Table 1 and Figure 3. The

methods of restoration of these canines reported at the patients' gender are represented in Figure 4. Following the endodontic treatment of the 59 mandibular canines, it was noted that 56 of them had a usual anatomy configuration of the root and root canal, while three of them showed morphological variations.

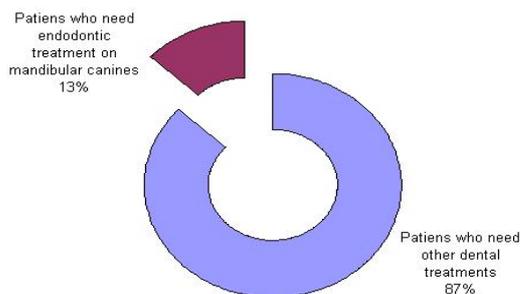


Figure 2 - Patients who needed dental treatments

Fig. 2. Patients who needed dental treatments

Types of restorations in mandibular canines with endodontic treatment

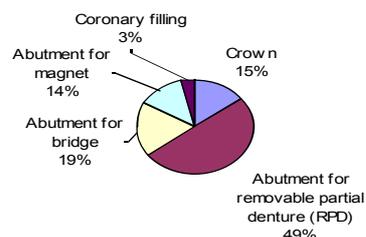


Fig. 3. Types of restorations in mandibular canines with endodontic treatment

Gender	3.3 Canine	4.3 Canine	Endodontic treatment	Crown	Abutment for RPD	Abutment for bridge	Abutment for magnet	Coronary filling	Variations
	30	29	59	9	29	11	8	2	3
Male	13	12	25	4	10	6	3	2	0
Female	17	17	34	5	19	5	5	0	3

Table 1. Types of restoration in mandibular canines with endodontic treatment

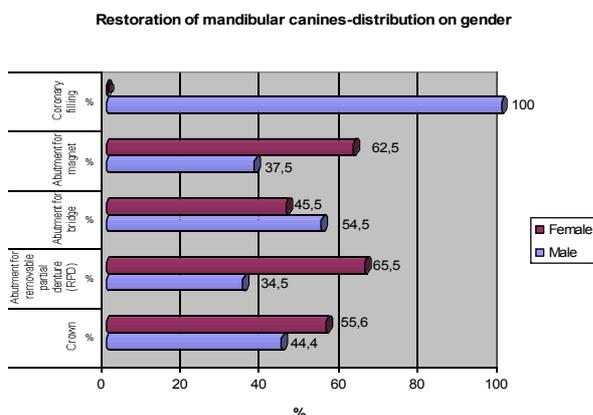


Fig. 4. Restoration of mandibular canines-distribution on gender

From these 3 cases, the first was a mandibular right canine with two roots (56 years old, female), each with one separate root canal, covered with a porcelain fused to metal crown.

Incidence of anatomical variations in mandibular canines

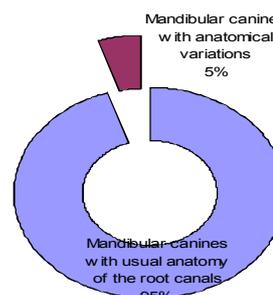


Fig. 5. Incidence of anatomical variations in mandibular canines

The second case is a patient of 53 years old, female, having a right mandibular canine with only one root, but two canals, used as abutment for a removable partial denture with ball and magnet attachments.

The third case (43 years old patient) was one left mandibular canine with one root and two canals used as abutment for a porcelain fused to metal bridge. None of these three cases presented bilateral anatomical variation.

RESULTS

From 282 patients who required any kind of dental treatment, only 36 needed endodontic treatment on the mandibular canines, the number of teeth involved being 59. Of these, a total of 56, representing 95%, presented the usual anatomy with one root and one central canal, while a total of three (5%) presented anatomical variations (Fig. 5).

In addition, in the entire sample consisting of 282 patients it was recorded the case of a patient showing both mandibular canines with anatomical variations, but he did not need endodontic or prosthetic treatment. The presence of these two canals in the canine could be seen on a panoramic X-ray by accident, because of the rotation of these teeth.

Under normal conditions, normal incidence bi-dimensional X-ray does not reveal the presence of morphological variations of endocanalicular space, for this being necessary to make eccentric X-rays or CBCT. Usually these morphological variations are discovered during clinical procedures of endodontic treatment, subsequently being done eccentric x-rays that reveal their particular anatomy.

DISCUSSION

Anatomical variations in terms of root number, root form or variation of endocanalicular system can occur on any tooth of the oral cavity. Although statistics show that the number of morphological variations is greater in pluriradicular teeth, some studies have shown their presence in monoradicular teeth [3,4,5]. Insufficient knowledge of endocanalicular space anatomy

seems to be the cause of most problems that occur during endodontic treatment [6]. Regarding the morphological variations of mandibular canine, they have been the subject of several studies in the literature. DJ Pecora [7], making a study of anatomy, direction and number of roots of mandibular canines, showed that 98.3% of them had one root and only 1.7% of the canines had two roots and two canals. In case of mandibular canines with a single root, the study authors found in 92.2% one canal and one opening hole, 4.9% two canals with a common hole, 1.2% two canals with two holes.

The mandibular canines with two canals, presenting one or two opening orifices were described also by Pineda F et al. and Vertucci FJ [8,9]. Also two roots with two separate canals have been reported by D'Arcangelo C et al. [10], by comparing two clinical cases. Pejman BV [11] found two canals in case of lower canines in 12% of cases; a similar study conducted by Kaffe et al. [12] results in a higher percentage, namely 13.75%. Green [13], following the analysis of 100 teeth, find a percentage of the mandibular canine with two root canals similar to the earlier studies, namely 13%; the percentage found by Hession [14] was about 11%. At the opposite we found the study of Bellizzi and Hartwell [15], where the outcome of the 195 X-ray examinations of mandibular canines was a percent of only 4.1%. In foreign literature we found described changes in the dental anatomy of different racial groups [16]. In Romania there are no currently available studies at the level of the population.

CONCLUSIONS

The lack of knowledge of root and pulp anatomy permits the errors in diagnosing and treatment planning. For the success of the endodontic treatment is critical to know the normal configuration of the pulp and to be aware of the possible variations. The best

possible information about the pulp anatomy is of course tridimensional, but we can not have always access to it. The most handy, useful and important knowledge of anatomy is gained from specialty literature (books, articles, studies, reports). We have to keep in mind the most common and frequent variations of each tooth and to know the approximate percentage of each. Radiographs are certainly useful, but not infallible because the standard parallel facial projection gives just two dimensions, overlooking the third one and the anatomical aberrations are generally not visible. Additional information of root number and anatomy is gained during access preparation and searching for the orifice of the canal. This method is also limited because sometimes canals are not easily discovered with instruments and the canal is not easily located. From the results of this study we can conclude that in Romanian population mandibular canines require a careful search for two canals or possible two roots because they can vary significantly in

root or more likely in pulp anatomy. Unusual root morphology can be sometimes bilateral, but not necessarily. Technologies as computerized tomography can provide much accurate three-dimensional morphologic information on the root anatomy of mandibular canines, but can not be used only for this reason.

Therefore, the variations of the mandibular canine regarding the number of root canals, or even on the number of the roots, are possibilities to be considered. Although the frequency of anatomical variations in the mandibular canine is reduced, we must not forget that such situations can occur in our private practice, because the long term success of the prosthodontic treatment depends directly on the quality of the endodontic treatment on the abutments. The fact that mandibular canine is an important abutment tooth for the future prosthetic restoration fully justifies larger studies on root anatomical variations on the Romanian population [17].

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