

The Clinical Significance of the Additional Mandibular Canals Morphological Features On Azerbaijani Population

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ABSTRACT

Introduction: in the article, the morphological characteristics of the additional mandibular canal during in adulthood on the Azerbaijani population and its differences from the main mandibular canal were determined.

Materials and Methods: a morphometric analysis of the main and additional mandibular canals was carried out of 45 adults from the fundamental museum collection of the Department of human anatomy and medical terminology of the Azerbaijan Medical University and 40 patients, who applied for implantation at Only Dent and White Dental clinics using X-ray panorama and CT methods. The width and length of the main and additional mandibular canals were measured and compared on the right and left sides. The obtained evidence was analyzed using the "Statistics" software package, the mean value was determined by $M \pm SD$ using the Shapiro-Wilk test.

Results: the detected additional mandibular canals start from the upper wall of the main mandibular canal, are shorter and smaller than main canal. Additional mandibular canal usually unilaterally located. Different types of additional mandibular canal are identified. In the first type, the additional canal is directed parallel to the main mandibular canal. There are two variants for a parallel additional mandibular canal: variants for internal and external location from the root of the molar. This type of canal also indicates the presence of the accessory nerve of the third molar and may lead to an unsatisfactory result of mandibular anesthesia in its treatment. In the third type, the additional canal, which has a larger diameter than the main canal, located parallel to it and is divided into two parts - upper and lower parts.

Conclusion: the additional mandibular canal starts from the upper wall of the main mandibular canal and has various types in Azerbaijani population. In the Azerbaijani population the additional canal is usually found unilaterally, shorter and smaller in diameter than the main mandibular canal. Formation the latter variants of the additional mandibular canal may be associated with early and combined separation of the molar nerves from the inferior alveolar nerve.

Keywords: Mandible; Mandibular Canal; Additional Mandibular Canal Types; Clinical Significance.

Introduction

The anatomical characteristics of the masticatory apparatus and the mandibular canal are important in clinical dentistry, endodontic treatment and dental implantation¹⁻⁸. Dental implantation and the injection of endodontic material into the root canal cause various types of damage and complications of the inferior alveolar nerve and located in the mandibular canal^{8,9}.

They depend on the location of the mandibular canal, the distance between the upper edge of the alveolar arch and the apex of the tooth root and the mandibular canal, and sometimes the formation of additional mandibular canals⁹⁻¹³. In this regard, the aim of the investigation is to study the morphological and morphometric characteristics of the additional mandibular canal of adult and during their clinical significance.

Material and Methods

A morphometric analysis of the mandibular and additional mandibular canals was performed on 45

adult mandibles from the fundamental museum of the Department of Human Anatomy and Medical Terminology of the Azerbaijan Medical University and 40 people who applied for implantation using X-ray panorama and CT methods at the Only Dent and White Dental clinics.

The mandibular canal was opened with the «Sniker» technical carving device. The width and length of the main and additional mandibular canals were measured and compared on the right and left sides. The obtained evidence was analyzed using the «Statistics» software package, the mean value was determined by $M \pm SD$ using the Shapiro-Wilk test. Correlation analysis was performed according to the Mann-Whitney test.

Results

The mandibular canal in Azerbaijani population is located in the spongy substance and has an arc-shaped structure that connects the mandibular foramen with the submandibular foramen and the protrusion faces down. Symmetric and asymmetric variants of the mandibular canals are defined.

Sometimes the mandibular canal splits into two on one side and additional canals are formed. Additional canals are shorter than the mandibular canal and depart from its upper wall. In the detected type I, the additional canal is located parallel to the main mandibular canal (fig. 1), its size (length - 21 ± 4.7 mm, width - 1.75 ± 0.4 mm) is smaller than of the main mandibular canal (length - 65 ± 1.5 mm, width - 2.5 ± 0.35 mm). These additional canal types in Azerbaijani population correspond to the parallel type additional canal according to the Naitoh classification¹³.



Figure 1. Additional mandibular canal (in an adult). 1 – right mandibular canal; 2 – additional mandibular canal.

Two variants of the location of parallel additional canals were identified – the canals were found on the outer and inner sides of the molar roots. The parallel additional canal is accompanied by the lower position of the mandibular canal and submandibular foramen. In one case, this type of additional canal was noted on both sides of the mandible – symmetrically (fig. 2).

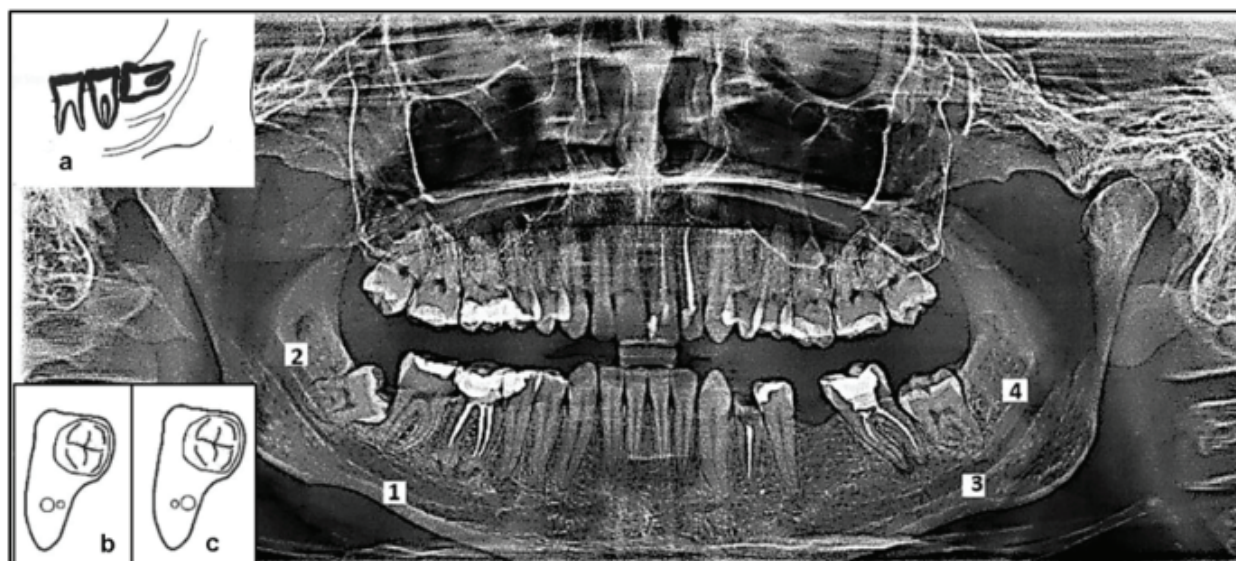


Figure 2. Additional mandibular canal (X-ray panorama of a 58-year-old woman). 1 – right mandibular canal; 2 – right additional mandibular canal; 3 – left mandibular canal; 4 – left additional mandibular canal; a, b, c – types of parallel additional mandibular canal according to Naitoh's classification; a – parallel additional mandibular canal type; b – additional parallel canal type located inside the molar roots; c – additional parallel canal type located outside the molar roots.

Type second type, according to the Naitoh classification, the molar type additional canal (fig. 3) separates from the main mandibular canal and rises up in the form of an arc, approaching the third molar, its length is 16 ± 2.2 mm, and its width is 1.5 ± 0.3 mm.

In the third type, the additional canal, which has a larger diameter than the main mandibular canal, is divided into two parts – upper and lower parts, located parallel to it (fig. 3). The length of the additional mandibular canal is 25 mm, its width is 2.2 mm. This canal type is not reported in the Naitoh classification. In this type of additional mandibular canal that we have identified, the additional canal is divided into two – upper and lower parts by a bone partition.

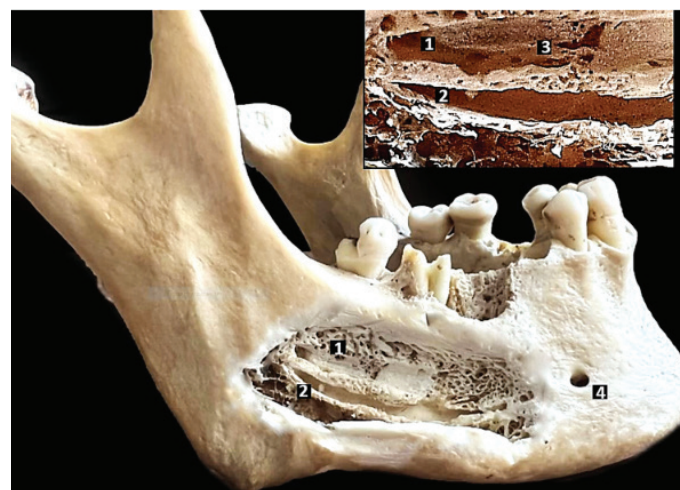


Figure 3. Additional mandibular canal (in an adult). 1 – additional mandibular canal; 2 – right mandibular canal; 3 – division of the additional mandibular canal into two parts by a partition; 4 – submandibular foramen.

Discussion

According to Naitoh's classification, the presence of additional canals of the mandible can be explained by the non-union of the canals where the retromolar and

molar nerve branches of the tooth are located during intrauterine development¹³, and ignoring them can lead to unsatisfactory mandibular anesthesia^{8,10-12,14}.

These additional canals result from failure of primitive canal fusion during the prenatal period and usually detected as incidental radiographic findings since they have no clinical landmarks⁸. Literary data confirm the possibility of the formation of an additional canal, since ossification around the branches of the inferior alveolar nerve and vascular branch during embryogenesis can lead to the formation of additional mandibular canals^{1,2,15}. It is known that in embryogenesis the inferior alveolar nerve divides into three branches, which later together form the inferior dental plexus. Of the branches, the first or retromolar branch runs parallel to the inferior alveolar nerve and belongs to the 3rd molar. Of the branches, the first or retromolar branch runs parallel to the lower alveolar nerve and belongs to the 3rd molar. From the branches of the inferior alveolar nerve second molar branch, again parallel to it, belongs to other molars. Third branch – the mesial or anterior branch goes to the incisors¹⁵. In embryogenesis, all three nerve branches are located in

a separate bone canal. These canals are connected to the main mandibular canal. Incomplete fusion of the canals also leads to the formation of various additional mandibular canals.

Conclusion

The additional mandibular canal starts from the upper wall of the main mandibular canal and has various types in Azerbaijani population. The additional mandibular canal is usually found unilaterally, shorter and smaller in diameter than the main mandibular canal.

In dental manipulations, the location of the mandibular and additional mandibular canals are of practical importance. Any dentist should determine whether there is an additional mandibular canal before dental implantation. Unexplained sensory disturbances and pain after implantation may be due to damage or compression of the mandibular canal walls. This type of canal indicates the presence of an additional nerve branch of the third molar and may result in unsatisfactory anesthesia in its treatment.

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