RETROMOLAR CANAL – AN ESSENTIAL STRUCTURE THAT IS OFTEN FORGOTTEN

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ABSTRACT

The retromolar canal is the anatomical branch of the mandibular canal. It contains a neurovascular bundle made of thin nerve fibers, veins and arteries surrounded by collagen fibers. The aim of the study was to review information about the retromolar canal presence and its consequences. The canal adjacent to the molar triangle may have different variants that occur at different frequencies. This canal constitutes 46.67% of all mandibular canal branches, making it the most common type of bifurcation, next to the canal branching upstream, buccal-lingual and to the tooth root. Thomas von Arx et al. classified variants of the alignment of the retromolar canal and distinguished five types. The retromolar canal and its content may be of great clinical importance for doctors in the area of the retromolar triangle. The retromolar nerve may contribute to inadequate anesthesia around the retromolar triangle, but this problem can be solved by techniques other than traditional anesthesia. Working in this area, doctors should take into account the possibility of damaging the neurovascular bundle. The analysis of the available literature show that the retromolar canal is not a rare phenomenon in the population. Therefore, should always be taken into account the possibility of its presence and consequences.

Key words: retromolar canal, retromolar foramen, cone beam computed tomography, panoramic radiographs, mandibular anatomy.

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INTRODUCTION

The retromolar canal is an anatomical branch of the mandibular canal, which according to the Naitoh is classified as type F [1]. The latest research proved that the retromolar canal constitutes 46.67% of all mandibular canal branches, making it the most common type of bifurcation, next to the canal branching upstream (40.00%), buccal-lingual (2.86%) and to the tooth root (10.48%) [2]. The retromolar canal begins as a bifurcation of the bony wall of the mandibular canal and runs towards the retromolar triangle, which is limited by the temporal crest from the medial side, the anterior edge of the mandibular ramus from the lateral side and the distal surface of the mandibular third molar [3, 4]. The retromolar canal contains a neurovascular bundle that is formed by thin myelin nerve fibers, veins and arterioles that are surrounded by collagen fibers along with a small amount of adipose tissue [5]. The nerve bundles running through the retromolar canal innervate the gingival mucosa of the lower premolars and molars [6]. There are also reports on the involvement of retromolar nerve in the innervation of the area of the retromolar triangle, the pulp of third molar, a part of the cheek mucosa and the temporal muscles [5]. Haas et al. [6] report that an abnormal branch for the buccal muscle...
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Retromolar canal (called the abnormal buccal nerve) can run through the retromolar canal. In some cases, damage to the neurovascular bundle may lead to complications in the form of hemorrhages, sensory disturbances and traumatic neuromas, which may occur following surgical removal of third molars, peroneal osteotomy or during mandibular nerve anesthesia [6-8]. Unfortunately, this structure is often overlooked in the textbooks that future adepts of dentistry learn from.

The aim of the study was to review information about the retromolar canal presence and its consequences. The scientific literature in the PubMed database was reviewed. The articles associated with the entry “retromolar canal” were analyzed. Due to repeated information in numerous articles, only 32 articles were considered in this paper.

DISCUSSION

The observation of a small and variable in terms of structure and course of the retromolar canal was possible thanks to the intensive development of imaging studies, especially computed tomography (CT) and cone beam computed tomography (CBCT) [9]. In some patients, the retromolar canal is already visible on the panoramic image, although this technique reveals only small percentage of the retromolar canals [10].

The tomography with a slightly higher radiation dose provides the possibility of assessing the jaw bone structures in three dimensions, which was not possible with the two-dimensional technique. On the other hand, compared to another three-dimensional technique – CT – CBCT allows for a precise examination with a lower single dose of radiation [5, 11, 12]. There are reports off the use of high-resolution magnetic resonance imaging to examine the mandibles of living patients and the endoscopic technique for imaging the course of the retromolar canal on “dry” cadaver mandibles [13-15]. Ikeda et al. [16] revealed that multiplanar MR imaging show excellent anatomic detail in the mandibular canal. Therefore, this imaging modality can be taking into account apart from CBCT and CT during finding anatomical variety of mandibular canal.

There was a great individual variability in the course, diameter and length of the canal in mandibles. Sometimes there course of the retromolar canal is bent. Moreover, in some cases, the main canal produces its own branches. Due to the availability of accurate imaging techniques, it has become possible to analyze the course of the retromolar canal. Tomas von Arx et al. [17] classified variants of the alignment of the retromolar canal and distinguished five types:

- type A1 – vertical course of the retromolar canal (Figures 1 and 2),
- type A2 – vertical course of the retromolar canal with a horizontal branch,
- type B1 – bent course of the retromolar canal (Figure 3),
- type B2 – bent course of the retromolar canal with an additional horizontal branch,
- type C – horizontal course of the retromolar canal.

According to research carried out by von Arx in 2005 type A1 was found in 20.7% of the patients, type A2 was 8.6% of the examined people, type B1 – 37.9%, type B2 was found in 13.8%, and 19% were classified as type C [18]. Based on the available mandibles, Motamedi et al. [19] estimated the average diameter of the retromolar nerve at 1.7 mm (range from 1.1 to 2.1 mm); in women this value was on average 1.5 mm, and in men 1.8 mm. Kim et al. [20] examined the contents of the retromolar canal. They found that the average area of the neurovascular bundle was 0.59 mm², and the areas of the artery and nerve, respectively were 0.07 and 0.05 mm². Studies on the presence of the retromolar canal have been conducted in various populations. CBCT studies of living adults, cadaver mandibles and the “dry” mandibles were analyzed. A lot of researchers have attempted to determine the frequency of the retromolar canal in the populations. They obtained different results: from the frequency of 1.7% (Ossenberg) to 75.4% (Patil et al.). Such diverse results were obtained due to the use of diagnostic techniques: CBCT, panoramic radiography and anatomical examinations on dry, macerated mandibles [5, 10, 21-27]. As stated in the studies by Haas et al. [6], the effectiveness of CBCT and CT in detecting the retromolar canal is almost four times higher than in the case of panoramic radiography.

FIGURE 1. Panoramic X-ray presents type A1 of retromolar canal on the right side

FIGURE 2. Panoramic X-ray presents type A1 of retromolar canal on the left side
However, there were no significant differences in the incidence of the apical canal between females and males [5]. Some studies suggest that one side may be more often characterized by the presence of the retromolar canal, while other researchers have obtained results indicating that there is no such relationship and there is no significant difference in frequency between the sides of the mandible [5, 13]. There are reports that the highest occurrence of the retromolar canal is observed in the group adolescents [12].

The retromolar canal may be of great clinical importance for clinicians working in the area of the retromolar triangle. The presence of the retromolar canal, may cause incomplete anesthesia in the retromolar triangle. Then the expected effect can be achieved by injecting a few drops of anesthetic in the area of the retromolar triangle. In the case of the retromolar canal it may be necessary to use the Gow-Gates technique or the Akinosi-Vazirani technique [3, 12, 28, 29]. The Gow-Gates mandibular block technique is based on anesthesia of the inferior alveolar nerve by administering the anesthetic to the area of the mandibular nerve from one puncture on the latero-anterior surface of the condyle. The injection site is determined by a developed mathematical algorithm. This algorithm allows to deposit the anesthetic in a very safe and very effective way [30]. The Akinosi-Vazirani technique for mandibular anesthesia is performed with the mouth closed. It can be used in all patients, but it is indicated in patients with trismus and problems with opening the mouth [31].

When performing surgical procedures, such as extraction of third molars, autologous bone grafting, orthognathic surgery or harvesting of a mucoperiosteal flap, the retromolar neurovascular bundle may be damaged and its injury may cause complications. These complications include excessive bleeding, sensory disturbances, formation of a hematoma, traumatic neuroma or bruising. Temporal paresis may also occur if the neurovascular bundle running through the retromolar canal has fibers aimed at this muscle [3, 5, 8, 12, 18, 29, 32]. The retromolar canal is a space where cancer and infection can potentially spread [12]. In prosthetically treated patients, the presence of the retromolar nerve may cause problems in the use of dentures and even difficulties in implanting dental implants [3, 33].

CONCLUSIONS

The analysis of the available literature show that the retromolar canal is not a rare phenomenon in the population. Therefore, doctors should always be taken into account possibility of its presence and consequences.

CONFLICT OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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