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ARQUIVOS EM ODONTOLOGIA

Mandibular canal bifurcation and trifurcation: case report from a finding obtained through cone beam computed tomography

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Aim: This case report aims to demonstrate a rare mandibular canal (MC) variation, presenting right trifurcation and left bifurcation through Cone-Beam Computed Tomography (CBCT).

Case report: A 26-year-old female patient with no systemic disorders was referred for surgical removal of the lower third molars due to the presence of painful symptoms. CBCT was requested to evaluate the relationship between third molars and the mandibular canal and to guide the surgical planning. Tomographic volume was analyzed through the Sidexis software (Sirona Dental Systems, Bernsheim, Germany). During the analysis of tomographic sections, it was possible to observe the presence of bilateral MC variations. Bifurcation of the right MC and trifurcation of the left MC were observed.

Conclusion: The present report highlighted the importance of CBCT for the diagnosis of anatomical changes, such as MC trifurcation.

Uniterms: Anatomy. Mandibular nerve. Cone-beam computed tomography.

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INTRODUCTION

The mandibular canal (MC) is an anatomical structure located in the ramus and body of the mandible[1], which extends from the mandibular foramen to the mental foramen, and is responsible for the passage of the vasculo-nervous bundle, which includes a nerve, an artery, and a vein. These structures are responsible for sensations, blood innervation of mandibular teeth, interdental papilla, and periodontal and alveolar bone tissue, respectively[2-4].

The MC may present anatomical variations in its course, and such variations along with the operator's technique, are the main cause of failure in the inferior alveolar nerve (IAN) anesthetic blockade[5]. Moreover, during common dental procedures that are performed near the IAN, there is a risk of temporary or permanent damage to the nerve[1]. When the MC presents a second branch, it is called the bifid MC[6]. Although the bifid MC is considered a rare anatomical variation, it should be carefully evaluated[7].

The prevalence of the bifid MC is uncertain, but studies using panoramic images have verified a prevalence between 0.35%[8] and 12.07%[9]. The incidence of bifid MC can be underestimated through panoramic radiographs, as it is an examination that does not allow adequate visualization of all canals[10]. Studies using three-dimensional (3D) exams have found a higher prevalence, between 22.6%[11] and 41.1%[12].

Another rare and scarcely reported variation is MC trifurcation[12-14], corresponding to the presence of a third branch. This condition has not been mentioned in previous classifications[10,15-17],

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although the identification of accessory MCs is essential to prevent complications during surgical interventions in the mandible[5].

Currently, Cone-Beam Computed Tomography (CBCT) is widely used in several areas of dentistry due to its 3D capacity[18]. Evaluating bifid MC through CBCT presents a higher incidence when compared to panoramic radiography. In addition, tomography enables the observation of the canal position, course, size, and branches[19,20]. This report aims to describe a rare MC variation, presenting right trifurcation and left bifurcation through CBCT.

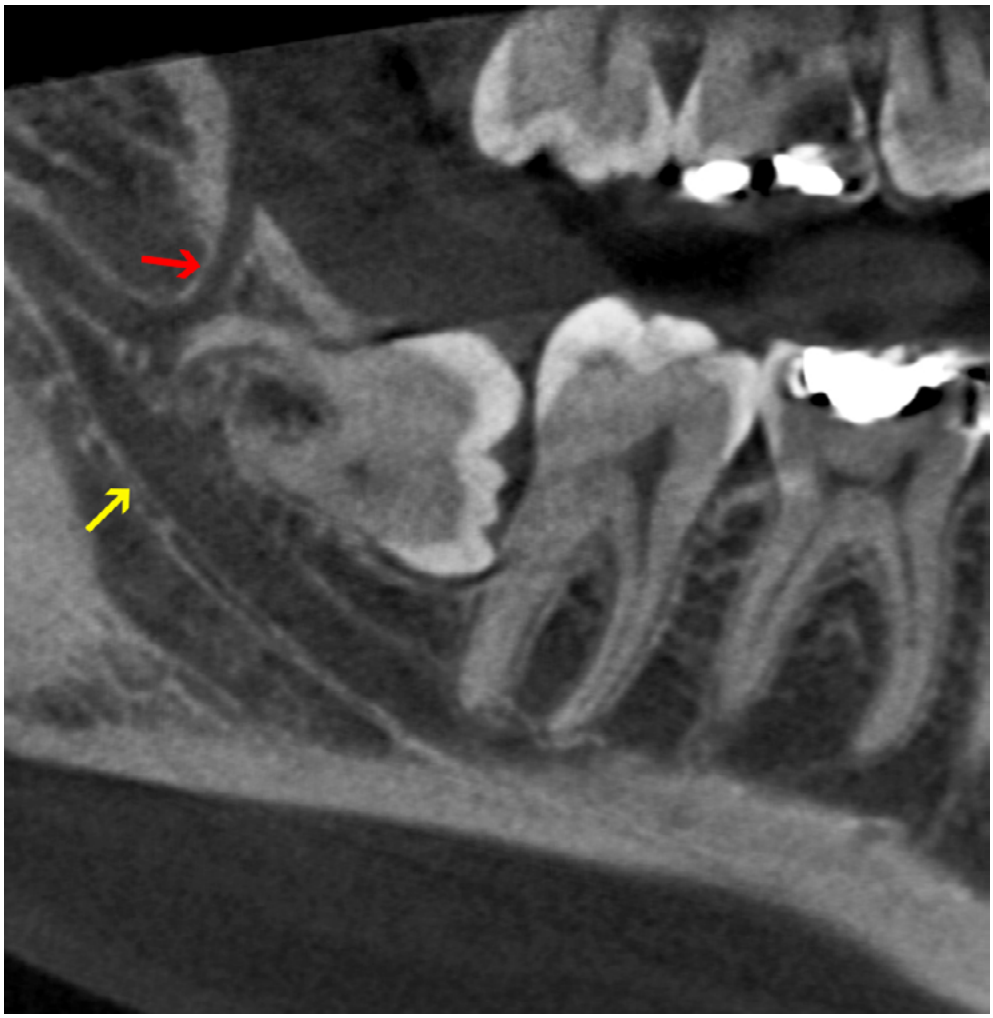
CASE REPORT

This case report was guided by the CARE guidelines (for CAse REports). A 26-year-old female patient with no systemic disorders was referred for the surgical removal of her lower third molars due to the presence of painful symptoms.

After observing the possible contact of the third molar with MC, CBCT was requested to evaluate the relationship between third molars and MC and to guide the surgical planning. The test was performed using the Orthophos XG® 3D device (Sirona Dental Systems, Bernsheim, Germany), operating on average with 70kV and 6mA, an FOV of 5 cm x 5cm, and a voxel of 0.1 mm. Tomographic volume was analyzed through the Sidexis software (Sirona Dental Systems, Bernsheim, Germany).

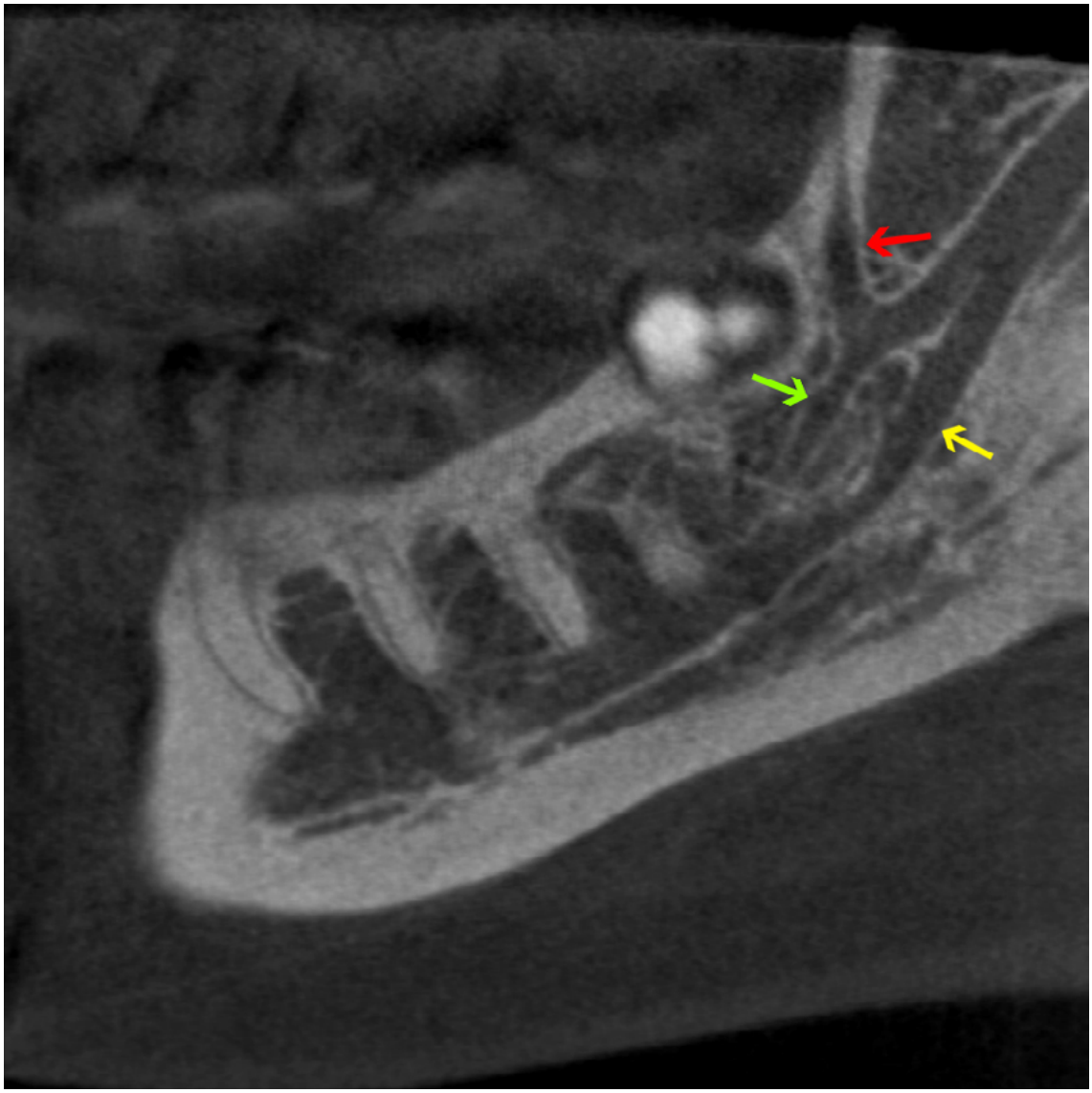
During the analysis of tomographic sections, it was possible to observe the presence of bilateral MC variations. In the right hemimandible, in a region posterior to third molar, an accessory branch was observed, ending its course in the retromolar position, as observed through coronal and axial sections, presenting MC bifurcation at the retromolar position (Figure 1), corresponding to Type II of Nortjé et al.[15], Type III of Kuribayashi et al.[10], and Type I of Langlais et al.[17] classifications.

FIGURE 1. The right main mandibular canal (yellow arrow) is observed through sagittal section. Just above, an accessory branch is observed in the region posterior to tooth 48, in the upward direction, ending its course in the retromolar position (red arrow).



In the left hemimandibula, in addition to the main mandibular canal, an accessory canal was observed in the retromolar position in the posterior region. A third branch was identified, located above the main canal and below the retromolar canal, dislocating downwards and in the posterior direction, ending its course in the mesial root of tooth 38 (Figure 2). However, none of previous classifications mentions the presence of three mandibular canal branches.

FIGURE 2. The sagittal section shows the left main mandibular canal (yellow arrow), an accessory canal in the retromolar region, in the upward and posterior direction (red arrow) and a third branch, located between the main canal and the retromolar canal, in the downward and anterior direction, ending its course in the mesial root of tooth 38 (green arrow).



After informing the patient about the proximity of MC with third molars and the risk of inferior alveolar nerve damage, planning for surgical removal was performed.

DISCUSSION

Several studies have evaluated the anatomical location and morphology of the bifid MC by means of panoramic images[8-10,14,17,21], but due to the limitations of two-dimensional (2D) exams, it is not always possible to diagnose such variations. However, CBCT evaluation enables the identification of variations that may not be seen in orthopantomography examinations[6,20,22]. In the present case report, in the initial analysis through orthopantomographic examination, is was not possible to observe MC variations. For better surgical planning, CBCT examination was requested, after which it was possible to observe the presence of left MC trifurcation and right MC bifurcation.

The frequency of accessory mandibular canals has been increasingly reported and the high prevalence attracts the attention of surgeons. Two studies carried out in the Brazilian population using tomographic examinations found a prevalence of 26.67%[6] and 30%[23] of bifid MCs. Previous studies have found no difference between sexes in relation to the presence of bifid or multiple MCs[3,5,6,12].

One study analyzing 925 panoramic radiographs did not identify any trifid MCs[14]. In the work of Castro et al.[12], performed with 700 CBCT images, only one trifid mandibular canal was identified, thus confirming the rarity of this anatomical variation.

A systematic review and meta-analysis comparing the use of panoramic x-ray and tomography to identify mandibular canal variations revealed a global prevalence of 4.20% in panoramic radiographs and 16.25% in CBCT[3]. Therefore, the superiority of 3D exams for diagnostic purposes was observed.

There are some classifications that categorize MC variations[15-17] into single and bifid, unilateral, or bilateral canals. However, none of these describes MCs presenting three branches. The study by Kuribayashi et al.[10] classified the accessory canal diameter into two categories: ≥ 50% (wide) or < 50% (narrow) of the main mandibular canal diameter, most of which presenting a narrow diameter. In this case report, it was verified that that the branches on both sides were classified as of a wide diameter.

Regarding the side of the mandibular canal alteration, studies have reported that most of them were found unilaterally, with a predominance of the right side[6,12]. However, in the present report, the variation was bilateral, presenting a trifurcation on the left side. Demonstrating the importance of conducting a thorough evaluation on both sides in order to check for changes in the mandibular canal and the presence of accessory branches.

Dentists should recognize the presence of MC variations in order to prevent possible complications, such as the failure of anesthetic blockade[5,24], hemorrhage, sensorineural disorder, formation of traumatic neuroma, or loss of dental implants[13].

In addition to oral surgery complications, the presence of accessory mandibular canals may have repercussions on implant dentistry. Aljunid et al.[13] reported using panoramic examination to plan and place a dental implant in the tooth 36 region. One week after the procedure, the patient reported exacerbated pain in the implant region. CBCT examination was performed and the presence of three accessory channels was observed, characterizing trifid MC[13], corroborating the importance of knowledge about anatomical MC alterations and the relevance of 3D exams.

The scarcity of studies on MC trifurcation most likely occurs due to its low prevalence or a use restricted only to 2D exams. The use of CBCT in this case allowed for the identification of MC variations, enabling an adequate surgical planning.

CONCLUSION

This case report showed the importance of CBCT for the diagnosis of mandibular anatomical alterations, thereby contributing to the scientific community through the description of a rare case of mandibular trifurcation.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

INFORMED CONSENT

Informed consent was obtained from the patients included in this study.

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Bifurcação e trifurcação do canal mandibular: relato de caso a partir de um achado em tomografia computadorizada de feixe de cone

Objetivo: Este relato tem por objetivo descrever uma rara variação do canal mandibular (CM) apresentando trifurcação direita e bifurcação esquerda, por meio da Tomografia Computadorizada de Feixe Cônico (TCFC).

Relato do caso: Paciente do sexo feminino, 26 anos de idade, sem comprometimento sistêmico, foi encaminhada para remoção cirúrgica dos terceiros molares inferiores devido a presença de sintomatologia dolorosa. Foi solicitada uma TCFC para avaliar a relação entre terceiros molares e o canal mandibular, para orientar o planejamento cirúrgico. O volume tomográfico foi analisado por meio do software Sidexis (Sirona Dental Systems, Bernsheim, Alemanha). Durante a análise dos cortes tomográficos, foi possível observar a presença de variações do CM bilateralmente. Observou-se bifurcação do CM direito e trifurcação do CM esquerdo.

Conclusão: O presente relato destacou a importância da TCFC para o diagnóstico das alterações anatômicas, como a trifurcação do canal mandibular.

Descritores: Anatomia. Nervo mandibular. Tomografia computadorizada de feixe cônico.