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Case

Bifid mandibular canal –an anesthetic challenge for maxillofacial surgeons– case report.

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Abstract: Bifid mandibular canal is a variation of the normal anatomy. Such anomalies can result in difficult anesthesia while performing surgeries of the posterior mandible under local anesthesia. Moreover there is a high chance of damaging the neurovascular bundle leading to complications. Here we present a case of a bifid mandibular canal which posed difficulty in achieving appropriate anesthesia. The inferior alveolar nerve is of special interest for maxillofacial and oral surgeons. Its relation with mandibular third molar plays an important role while performing disimpaction surgery, in cases of bilateral sagittal split osteotomy, prosthesis placement in resorbed ridges, mandibular trauma procedures, and may be traumatized by penetration of the implant drill.

Keywords: Anesthesia; dental; paresthesia; radiography; trigeminal nerve; inferior dental nerve.

INTRODUCTION.

One of the very rare anatomical variation the maxillofacial surgeon may come in his practice is a bifid or trifid mandibular canal.[1] The mandibular canal or the inferior alveolar canal transmits the inferior alveolar nerve and vascular bundle, which is the branch of the mandibular nerve, third division of trigeminal nerve. The variation of this anatomy has important clinical implications for the surgeons.[2] The most common problem faced by the maxillofacial surgeon is to achieve adequate anesthesia of the lower teeth, which are supplied by this nerve.

The other complications include trauma to the extra inferior alveolar nerve during the surgical removal of third molars, excessive bleeding due to injury to the vascular bundle, traumatic neuroma.

A bifid or trifid mandibular canal can be detected in a panoramic radiograph view, or, for better identification, by computed tomography or cone beam computed tomography.[1] Prior identification of an extra neurovascular bundle can help in the better planning of surgeries and curtail the associated complications.[2]

CASE REPORT.

A 28 year old male patient reported to the department of oral and maxillofacial surgery with a chief complaint of pain over the left back tooth region for the past three months; the pain was recurrent in nature.

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Clinically, 38 was horizontally impacted, with only the distal cusp visible. A panoramic radiograph was obtained which showed bifurcation of the mandibular canal. The first branch was very close to the mesial root of 48 and the second branch was located 3mm above the lower border of the mandible. (Figure 1)

Due to recurrent pericoronitis, surgical removal of 38 was planned. About 4ml of local anesthetic block was applied by classical inferior alveolar nerve block technique. Objective and subjective symptoms assessment resulted positive. But during the surgical removal of the tooth, the patient still experienced unbearable pain. It was decided

Figure 1. Panoramic radiograph showing bifurcation of the mandibular canal.

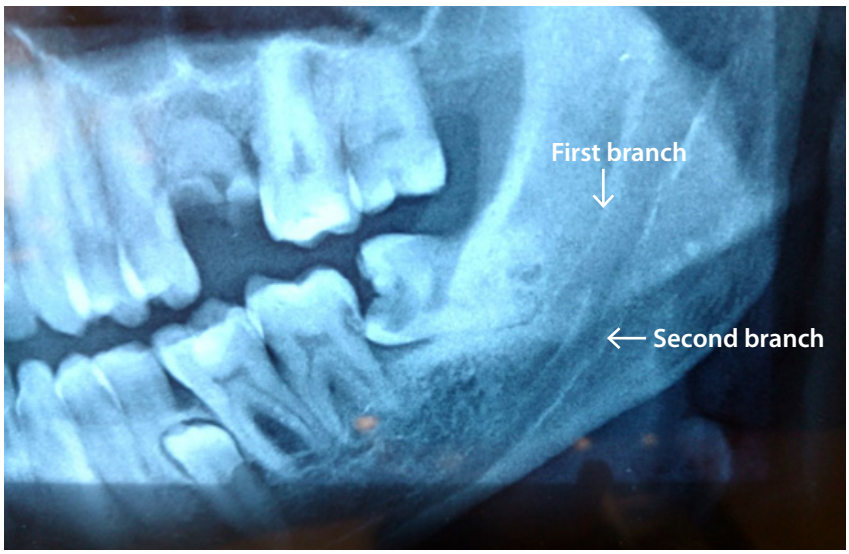
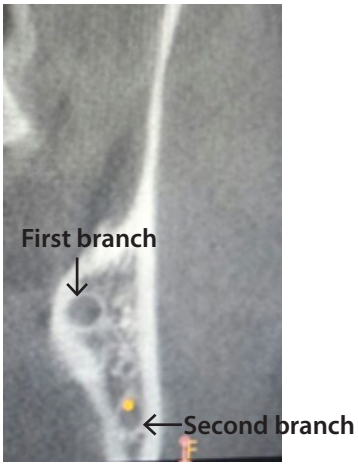


Figure 2. Cone beam computerized tomography image showing bifurcation of the mandibular canal.

Figure 3. Saggital section of CBCT showing bifid canal.



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to split the tooth vertically, and an intrapulpal injection was applied when the pulp was reached, after which the patient's pain perception was reduced.

For better understanding the difficulty of achieving anesthesia, a cone beam computerized tomography (CBCT) was taken. The CBCT showed two separate mandibular canals that united at the mental foramen. (Figure 2 and 3)

The patient gave informed written consent for the case to be presented, and the CARE guidelines were followed for the writing of this case.

DISCUSSION.

The inferior alveolar nerve is of special interest for maxillofacial and oral surgeons. Its relation with mandibular third molar plays an important role while performing disimpaction surgery, traumatised by implant drill penetration, in cases of bilateral saggital split osteotomy, proximity of prosthesis, fracture reduction and fixation.[1] The mandibular canal is a single bilateral structure, but rare anatomical variations like a bifid or even trifid mandibular canal also has been reported.[4]

The mandibular canal transmits the inferior alveolar nerve, which is the branch of the third division of the mandibular nerve, along with the inferior alveolar artery and inferior alveolar vein. Mandibular teeth and the surrounding mucosa are innervated by this nerve and this nerve exits from the mental foramen giving rise to mental nerve.[5]

Chaveze *et al.,*[9] has suggested that during embryologic development the three inferior dental nerves innervating the three groups of mandibular teeth fuse together to form a single canal; this could explanation that if any of the branch fails to fuse it results into canals with cleft. Along the canal inferior alveolar nerve is approximately 4mm.[6]

Carter *et al.,*[10] classified the inferior alveolar nerve and its variation.[6] Incidence of the bifid canal ranges from 0.05 to 65%, with no sex predilection as a few studies have shown male predominance while others shown it to be more prevalent in females.[7,4] Many classifications of inferior alveolar canal have been proposed, based on anatomical location and configuration by using panoramic radiographs, computed tomograms and CBCT. Cone beam computed tomogramy is considered to have higher accuracy in detecting bifid or trifid canal compared to panaromic radiographs.[1]

Langlais *et al.,*[11] found an incidence of bifid mandibular canal of 0.96%, and Nortjé *et al.,* [12] found the incidence to be 0.9% by panoramic radiography.

Naitoh *et al.,* [13] used cone beam computed tomography for a better identification of the bifid and trifid canals.

The classification of bifid mandibular canals put forward by Langlais *et al.,*[11] is the most popular in the literature, using panoramic radiography. Other classifications were proposed by Nortjé and Naitoh.

Sometimes the mylohyoid groove containing the mylohyoid nerve or intrabony trabeculae is mistaken as a bifid mandibular canal.[1] A retrospective study done by Corer *et al.,*[4] on around 75 patients with bifid mandibular canals, similar to the variation found in the present report, found an high incidence 21% of intimate contact of third molar roots with the mandibular canal bifurcation.

Kuribayashi *et al.,*[14] consider that the reported incidence of bifid mandibular canals may be superior when using CBCT, since panoramic radiographs are less likely to detect narrow canals.[4] As there are different classifications for bifid mandibular canals, our case can be categorized into Langlais type II in which the unilateral bifurcation extends along the main canal and then comes together in the mandibular body.

In cases of bifid or trifid mandibular canals, intense care should be taken while performing surgery related to the mandible, even minor extractions can be difficult as inadequate anesthesia may result even after a proper classical inferior nerve block. Other minor and major surgeries like disimpaction of mandibular molars, implant placement, reduction of fracture fragments, compression due to artificial prosthesis in edentulous atrophic mandible, mandibular osteotomy, may also be affected.[6] Complications that can be encountered during these surgeries include various degrees of nerve injury, traumatic neuroma, excessive bleeding, paresthesia, and numbness in the chin and lips. After proper identification of extra canals with the help of radiographic images, different anesthetic technique like the Gow-Gates can be used to increase the effectiveness of local anesthesia, and careful surgical technique can reduce major complications.[8]

CONCLUSION.

The proper anatomic knowledge of the mandibular canal and inferior alveolar nerve along with its variation and radiographic assessment are essential for the maxillofacial surgeons when planning treatment involving the mandible. The variation of this canal along with the neurovascular bundle can result in serious complications like neuroma, paresthesia and hemorrhage.

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