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Are Retromolar Canals Rare Enough To Be Ignored?

Varun Arya, *Minerva Singh, Santosh Mishra, Rajeev Pandey, Sanjeev Kumar, Ankit Chowdhry,
Department of Oral and Maxillofacial Surgery, Faculty of Dental Sciences, SGT University, urugram, Haryana.
*E-mail: minervasingh03@gmail.com

ABSTRACT
Retromolar canal is a rare anatomical variant of Inferior Alveolar Nerve Canal, present distal to the rearmost mandibular molar. The retromolar canal houses a neurovascular bundle which explains its significance. Presence of retromolar canal can lead to inefficient anesthesia and trauma to retromolar neurovascular bundle during dental and maxillofacial procedures certain complications. We present a report of two cases who presented with Type B2 retromolar canal as seen on Cone-Beam Computed Tomography scan. One patient was symptomatic and was treated using liquid nitrogen cryotherapy probe. Both patients were asymptomatic after 6 months, postoperatively. Knowledge of such variations is a must before any surgical procedure in order to avoid any neurovascular complications and it has been well established that Cone-Beam Computed Tomography is best available modality to diagnose such variations.
***Key words**: Inferior alveolar nerve, Mandibular canal, Anatomic variant, Foramen, Cone-Beam Computed Tomography*

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INTRODUCTION

Inferior Alveolar Nerve's anatomy variations have been described in the literature, it can have both extra-osseous as well as intra-osseous branches. Intra-osseous branches lead to variations in the mandibular canal, these can be bifid, trifid, retromolar canal or presence of accessory foramina, which pose as a major concern during a dental or maxillofacial procedure. Complications during or after a surgical procedure include somatosensory impairment, excessive hemorrhage and traumatic neuroma. Presence of such a variation is also responsible for inadequate anesthesia when conventional Inferior Alveolar Nerve block technique is used[1-3].

Mandibular canal variations as reported in literature, using panoramic radiography have an occurrence of <1%. However, in studies using C0mputed Tomography(CT) and ConeBeam Computed Tomography (CBCT), these variations range between 20 – 30%[4-6].. No significant differences have been noted between genders or the sides of the mandible[7-9].We present a report of two cases who presented with a variant of retromolar canal on CBCT, which has not received enough attention in literature.

MATERIAL AND METHODS

Case 1

A 31 years old, female presented to the out-patient department of 0ral and Maxillofacial Surgery with a complaint of severe, sharp, shooting neuralgia type pain originating from left lower third molar and radiating towards the left ear since 3 days, which did not relieve on medication. There was history of surgical extraction of impacted left lower third molar 4 days back at a private clinic, the procedure was uneventful. On clinical examination, sutured socket was seen with no indications of dry socket or infection. No somatosensory impairment was noted. Post-operative digital intraoral periapical radiograph (IOPAR), as retrieved from the patient revealed an extraction socket with respect to 38 with close approximation with IAN canal however, any breach could not be established (Fig. 1). CBCT was advised, which revealed a close approximation of IAN canal with the extraction socket but no breach was identified, it also showed bifid IAN canal posterior to extraction socket of third mandibular molar, indicating the presence of retromolar canal (Fig. 2. A, B). Retromolar canal was curved with an accessory horizontal branch passing through the buccal side of extraction socket of left lower third molar, depicting Type B2 retromolar canal as explained by von Arx *et al* 2011b .The patient was treated using liquid nitrogen cryotherapy probe and was asymptomatic after 6 months post-operatively.

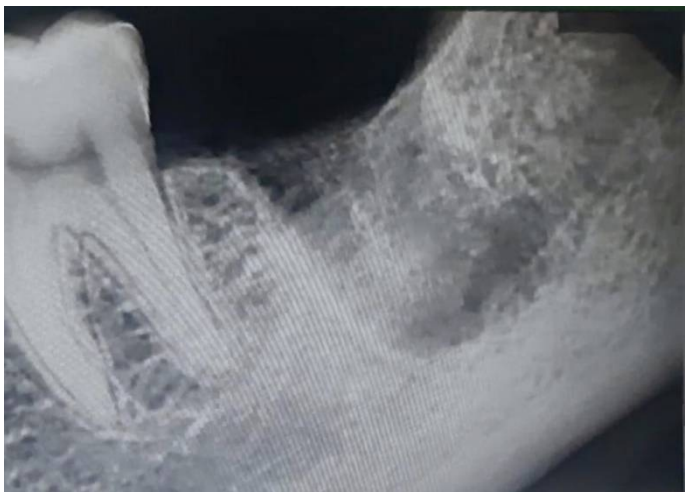

Figure 1. Post-operative digital peri-apical radiograph with respect to Left mandibular third molar of case 1.

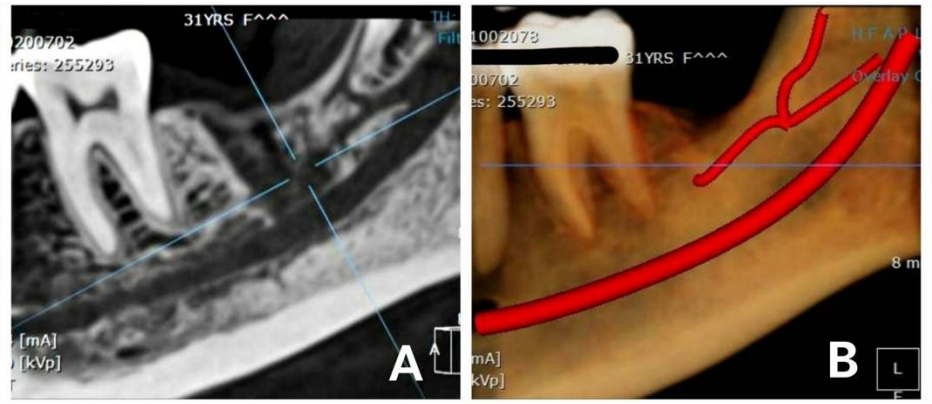

Figure 2: Post-operative CBCT of case 1 showing Type B2 retromolar canal.

Case 2

A 27 years old, man presented to the out-patient department of Oral and Maxillofacial Surgery with a complaint of pain with respect to left lower second molar since one week, as it was case of endodontic failure. The tooth was planned to be extracted followed by implant placement, thus a CBCT scan was advised which revealed Type B2 retromolar canal (Fig. 3). The tooth was extracted while taking care of retromolar canal followed by implant placement accordingly. The patient was asymptomatic after 6 months post-operatively.

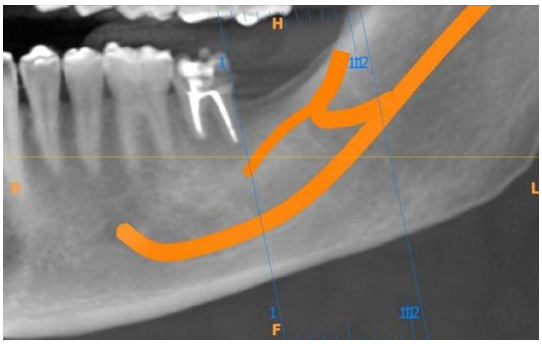

Figure 3: CBCT of case 2 showing Type B2 retromolar canal.

RESULTS

Case 1 gives us an insight of the situation where the operator did not take the presence of retromolar canal into consideration leading to patient having postoperative complications whereas, case 2 is about how complications can be avoided if the operator already has a knowledge of retromolar canals and their variations.

DISCUSSION

When the mandibular canal divides into two parts, it is known as a bifid mandibular canal. During prenatal period, around 7th week of intrauterine life, remodeling in the ramus region occurs along with "intramembranous ossification" that starts where IAN gives off mental and incisive nerves. As the ossification occurs alongside the lateral border of Meckel's cartilage, a gutter is formed around IAN, which leads to the formation of mandibular canal. This somehow clarifies the occurrence of anatomical variations in mandibular canals because of incomplete fusion of these three separate branches[10].The Retromolar canal is a Type 1 bifid mandibular canal which is a unilateral or bilateral transverse bifidity. A Retromolar canal arises distal to the last mandibular molar tooth, follows an antero-posterior course and then, exits via retromolar foramen present in retromolar fossa region. The first cadaver study on retromolar canals was conducted by Schejtman et al. 1967[11,12].

Mandibular canals variant presence is usually considered identical with variant inferior alveolar nerve. However, it's likely that these canals just encircle the blood vessels, not the nerves as well. The neural bundle that passes via retromolar canal might provide innervation to mandibular last molar, mucosal tissue of retromolar area or even to accessory branches of long buccal nerve which innervate buccinator muscle and tendon of temporalis[13].

Retromolar canal, if undisclosed, may cause complications during dental and maxillofacial procedures such as mandibular third molar exodontia, implant placement, sagittal split ramus osteotomy, ramus bone harvesting etc. Complications include paresthesia, hemorrhage, hematoma formation and even traumatic neuroma, the vasculature of the retromolar canal may also spread the infection or tumor cells to systemic circulation. Retromolar canal's presence is also a reason for IAN block failure. An alternative technique can be used in such cases such as injecting the retromolar region with local anaesthesis or use of Gow-Gates or Akinosi-Vazirani technique[14,15].

Retromolar foramina occurance incidence ranges from 5.4 percent to 75.4 percent in some CBCT investigations, and from 3.2 percent to 72 percent in cadaver studies. According to panoramic radiography studies, retromolar foramen occur anywhere from 3.06 percent and 8.8 percent of the time. The mandibular side, age, or gender have not been linked to the development of retromolar canals in the present body of research[16].

Von Arx et al 2011b classified retromolar canals according to the course and morphology: Type A1: vertical course of retromolar canal, Type A2:vertical course of retromolar canal with additional horizontal branch(Fig. 4),Type B1:curved course of retromolar canal, Type B2: curved course of retromolar canal with additional horizontal branch (Fig.5) and TypeC: horizontal course of retromolar canal (Fig. 6).

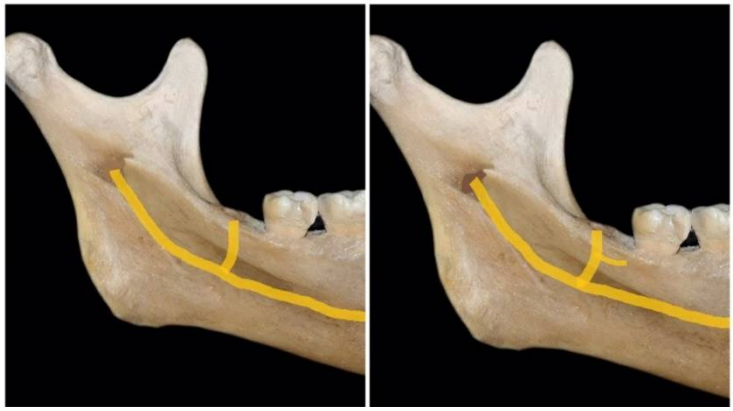

Figure 4. Type A1 and A2 configurations of the retromolar canal.

Figure 5. Type B1 and B2 Type C configurations of the retromolar canal.

Filo *et al* (2015) found that the Type A1 is most common (39.82%), followed by Type B1 (24.07%), A2 (18.98%), B2 (11.11%) and C (6.02%). Our patients presented with Type B2 retromolar canal, which is quite rare according to literature .Considering the relationship between retromolar foramen andmandibular molar, Filo *et al* 2015 revealed distance of 2.80–24.80 mm, von Arx et al. 2011b evaluated mean of 15.16 mm with a range varying 12.32–22.32 mm, using CBCT. Bilecenoglu and Tuncer 2006, reported distance of 9.50–24.27 mm, in a cadaveric study. If third molar is present, retromolar canals exhibit smaller distances to the second molar. As measured by von Arx et al 2011b, the average diameter and height of the retromolar canal are 1.03 mm and 10.19 mm, respectively[17-18].

In relation to the diagnosis of retromolar canal, the superiority of the CBCT over the Orthopantomogram, is well known. A comparative study revealed retromolar canal in 25.6% of the examined sides using CBCT, whereas only 5.8% were revealed using Orthopantomograms [19,20].Occurrence of anatomically variant mandibular canals is rare. Retromolar canal, is a type of bifid anatomical variant of mandibular canals which usually contains accessory neurovascular bundle. Unknown presence of retromolar canals may cause failure of local anesthesia technique and pose a major concern during and after dental and maxillofacial procedures like lower third molar extractions, sagittal split osteotomy, autologous ramal graft harvesting etc. Thus knowledge of such variations is a must before any surgical procedure and it has been well established that CBCT is best available modality to diagnose such variations. However, we do not recommend CBCT for every case but it should be in the knowledge of operator so that they can order CBCT if any suspicious findings are seen on IOPA or OPG, more specifically in major surgical procedures.

CONCLUSION

For minor procedures, the operator should always consider retromolar canals to be present unless proven otherwise and take necessary precautions so that intra and post-operative complications can be avoided.

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