



BIFID MANDIBULAR CANAL: REPORT OF TWO CASES

Maxillofacial Surgery

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ABSTRACT

The bifid or trifid mandibular canal is an anatomical variation. Its presence is of significant clinical importance. The knowledge of anatomic variations is helpful in diagnosis, treatment planning and is of paramount importance to avoid intra operative and postoperative complications. This paper describes two cases of bilateral bifid mandibular canals.

KEYWORDS

Bifid, Mandibular Canal

INTRODUCTION:

Inferior alveolar nerve along with inferior alveolar vessels enters the mandibular foramen and courses in the ramus and runs in the body of mandible, giving off multiple branches to the teeth and exits at mental foramen as mental nerve to supply lower lip and chin area, a small branch continues as incisive nerve to supply the anterior teeth.¹ The nerve is around 4mm in diameter in the canal.² The anatomical variations of inferior dental canal are, it runs either close to the alveolar margin or it makes a deep curve in the body of the mandible and exits through mental foramen. The inferior alveolar canal is a single canal but accessory canal can be observed occasionally as bifid canal, along with accessory mental foramina. The term bifid is a Latin word meaning a cleft into two parts or branches.² The presence of bifid canal is observed on panoramic view and in detail on CBCT.

The accurate assessment of the course and position of the inferior alveolar canal in the mandible is important in order to prevent potential complications. The presence of an accessory canal can be challenging in achieving profound anesthesia, removal of impacted third molars, placement of implants and mandibular orthognathic surgeries. The injury to inferior alveolar neurovascular bundles can lead to bleeding, paraesthesia, anesthesia, and traumatic neuroma formation. In edentulous jaws, bone resorption can result in a canal running close to the alveolar ridge. In this situation wearing denture can cause discomfort.^{3,4}

Case Report 1 -

A 73 year old patient reported with a chief complaint of pain in the right lower posterior region for six months, swelling for one month and paraesthesia for 15 days. On examination, extra oral swelling measured 3 x 3 cm, extended from ala tragal line superiorly to about 2cms below the lower border of the mandible, it was firm. The lower jaw was edentulous, with a draining sinus intraorally in right lower third molar region. On probing through the sinus, the presence of the tooth was ascertained. The provisional diagnosis of chronic suppurative osteomyelitis was made. Orthopantomogram was advised, OPG showed horizontally impacted 48 with radiolucency around 48, extending up to inferior alveolar canal. The CBCT showed horizontally impacted 48 along with pericoronary radiolucency extending to involve the entire crown and the root tip of the tooth. Bifurcation of the mandibular canal bilaterally was seen, running below the main canal and parallel to it indicating a Type 2D Langlais et.al classification.

Case-2

A 21 year old female patient reported with a chief complaint of pain in the lower left back tooth region. On examination, it was diagnosed as pericoronitis in relation to impacted 38. The treatment plan was the removal of the impacted third molar and Orthopantomogram was advised. On OPG bilateral double tram lines were suspected. To confirm the same, CBCT was advised. CBCT of mandible showed Bifid mandibular canal bilaterally extending from ramus to the region of mandibular body where they fused as one mental nerve on either sides, a Langlais Type 2D canal and according to Naitoh classification a forward canal with confluence. The classical inferior alveolar nerve block was given and profound anaesthesia was achieved. The third molar was surgically removed. The post-operative healing was uneventful.

DISCUSSION-

The various causes for bifid or accessory mandibular canals are suggested. According to Chavez et al. during embryologic development there are 3 inferior alveolar nerve innervating the 3 groups of mandibular teeth which eventually fuse together and form a single nerve with one canal.¹⁰ This explains lack of fusion of any one of the nerve would lead to occurrence of accessory canals.^{4,5} The panoramic views may show anatomical structures like deep mylohyoid groove as duplicated canal or intra bony dense trabeculations can also show as accessory canal.^{5,6}

The incidence of bifid mandibular canal reported earlier was low, probably because the availability of orthopantomogram only. Bifid mandibular canal was studied by using different radiographic techniques by many authors. In 1973, Patterson discovered a case of unilateral BMC with two mental foramina and in the same year Kiersch and Jordan published about a case of BMC found on radiograph. In 1978 a study of 3612 panoramic radiographs revealed 0.9% incidence of bifid canal.

Nortje et al and Langlias et al found 0.9% and 0.96% incidence of bifid mandibular canal on panoramic radiographs. Similar studies done by Grover and Lorton, Sanchiz et al, Zografos et al concluded the prevalence of bifid mandibular canal as 0.08%, 0.35%, 0.4% respectively. Durst and Snow 8.3% incidence.⁶

Lindh et al reported the 25% Bifid Mandibular Canal incidence based on the panoramic radiography.³ The literature shows incidence of Bifid Mandibular Canal on Panoramic radiograph ranges from 0.08% and 0.95%. The advances in imaging technique, use of CBCT has improved the identification and evaluation of the variation of the mandibular canal in detail. The diagnostic imaging CBCT has an inherent advantage of good visualization, low cost, less radiation and widely available.³ The frequency of BMC on CBCT interpretation is 15.6-64.8%.⁷ Kuribayashi et al in a study reported the incidence of 15.6% of BMC on CBCT. CBCT is considered superior in identification of variations in the mandibular canal. The panoramic radiographs are not adequate to identify second accessory canals especially if it is a narrow one.

The other structures which mimic BMC on panoramic images are grooves of the mylohyoid nerve located in the rami of the mandible, on the inner surface. In 1973 Kiersch and Jordan explained the reasons for falsely identifying as bifid canal on radiograph. The mylohyoid nerve as it separates from the inferior alveolar nerve runs on the inner surface of the mandible, where a deep mylohyoid groove can imprint as a separate canal on the two dimensional image. The osteocondensation produced by the insertion of mylohyoid muscle parallel to the inferior alveolar canal can also produce a false image of bifid canal.^{4,5,6}

Bifid Mandibular canal classification according to Carter and Keen.²

- Type I: the inferior alveolar nerve is a single large structure lying in a bony canal.
- Type II: the inferior alveolar nerve is situated substantially lower down in the mandible.
- Type III: the inferior alveolar canal is separated posteriorly into two large branches, which together could be regarded as equivalent to an alveolar branch.

Langlais et.al classification of Bifid mandibular canal-

Type of BMC	Description
Type 1	Unilateral extending to the region of the third molar Bilateral extending to the region of the third molar
Type 2	A. Unilateral extending along the main canal and then coming together in the mandibular rami. B. Unilateral extending along the main canal and then coming together in the mandibular body. C. Bilateral extending along the main canal and then coming together in the mandibular rami. D. Bilateral extending along the main canal and then coming together in the mandibular body.
Type 3	Combination between types 1 and 2
Type 4	Two canals from two distinct origins, and then joining to form a single ,large mandibular canal

Naitoh et.al based on CBCT classified Bifid mandibular canal into 4 categories they are, Forward, Buccolingual canal, Dental canal, Retromolar canal based on the source site and course of the accessory canal in relation to mandibular canal.

1. Forward canal- the accessory branch emerges from the upper border of the main canal. This is of 2 types
 - A. Forward canal without confluence- It separates from the mandibular canal in the ramus and then extends to the 2nd molar area.
 - B. Forward canal with confluence- It separates from the mandibular canal in the mandibular ramus extends anteriorly and then re-joins to the main mandibular canal
2. The end of the separated canal reaches the root apex of the first, Second and third molar
3. Retromolar canal- the branch emerges from the main canal and reaches the retromolar region.

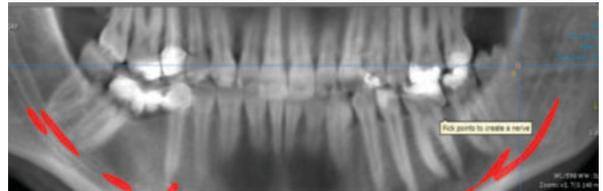
A retrospective study on 500 Turkish patients using CBCT to assess the variations of mandibular canal showed 40% incidence of BMC. Mandibular canal variation was 71.5% on the right side, 52.5% on the left side and 24% bilaterally.⁷

According to Naitoh et al, the most common variation of bifid canal was forward canal 27.9% and least was buccolingual canal 0.8%. Among the 4 categories of BMC, retromolar and dental canal variant are at higher risk. The removal of impacted third molar or in harvesting ramal block graft pose a threat to retromolar canal. It has considerable variation in course, it can be difficult to predict the exact position of the IAN, thus frustrating a proper pre-operative planning as well as intra operative surgery.⁹

The presence of an additional dental canal can cause problem in achieving profound anaesthesia with classical inferior alveolar nerve block.⁸ In such situations Gow-Gates method or Akinosi method should be adopted. The presence additional dental canal can cause problem during extraction and root canal treatment. The accidental injury to the accessory canal can lead to paraesthesia, anaesthesia, traumatic neuroma. The presence of vessels along with the nerve can lead to bleeding. The knowledge of the presence of accessory canals is important in planning and placing implants and during orthognathic surgeries of mandible.

CONCLUSION –

Bifid mandibular canal is a rare anatomic variation. Its identification, extent of branching has to be analysed, while performing surgeries in the mandible with best diagnostic imaging modality like CBCT. knowledge on anatomic variations influences the diagnosis, treatment planning and eventually the management.



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