

## Mandibular canal branches supplying the mandibular third molar observed on cone beam computed tomographic images: Reports of four cases

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### ABSTRACT

Bifid mandibular canal can be an anatomic variation. This condition can lead to complication when performing mandibular anesthesia or during extraction of lower third molar, placement of implants and surgery in the mandible. Four patients underwent preoperative imaging for extraction of third molars using CBCT (CB Mercuray, Hitachi, Japan). The axial images were processed with CBworks program 2.1 (CyberMed Inc., Seoul, Korea). The branches for supplying the lower third molar were identified mainly on cross-sectional and panoramic images of CBCT. Since the location and configuration of mandibular canal variations are important in any mandibular surgical procedures, we report 4 cases of bifid mandibular canal with panoramic and the CBCT images. (*Korean J Oral Maxillofac Radiol* 2009; 39 : 209-12)

**KEY WORDS :** Bifid mandibula canal, Cone beam computed tomography

### Introduction

The mandibular canal passes through the mandible from the mandibular foramen to the mental foramen, involving the inferior alveolar nerve, artery, and vein. The canal is ramified to supply nerve, artery, and vein to each tooth in the mandible. The location and configuration of mandibular canal variations are important in surgical procedures involving the mandibular, such as extraction of an impacted third molar, dental implant treatment, and sagittal split ramus osteotomy.<sup>1</sup>

Some variations of the mandibular canal (so called bifid mandibular canal) have been reported using panoramic radiographs, computerized tomography (CT), and cone beam CT (CBCT)<sup>2-5</sup> Cone beam computed tomography (CBCT) technology has a substantial impact on maxillofacial imaging. It has been applied to diagnosis in all areas of dentistry and is now expanding into treatment applications.<sup>6</sup> CBCT has enabled us better to visualize the anatomy of the mandibular canal and ramified canals.<sup>1</sup> We report 4 patients with bifid mandibular canal using panoramic and CBCT images. The cases reported here were prescribed for impacted third molars. Four patients underwent preoperative imaging for extraction of third molars using CBCT

(CB Mercuray, Hitachi, Japan). The axial images were processed with CBworks program 2.1 (CyberMed Inc., Seoul, Korea). The branches for supplying the lower third molar were identified mainly on cross-sectional and panoramic images of CBCT. To locate the bifid canal, the center of the panoramic images (parallel to the referencing curve on axial view) of CBCT were moved buccolingually by 0.1 mm in all the four cases.

### Case Reports

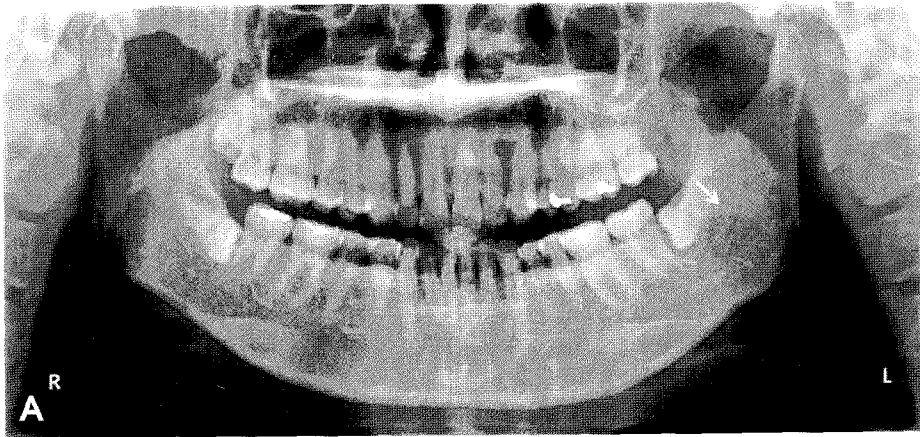
#### Case 1

A 45-year-old woman was referred to the radiologic department for evaluation of impacted third molars. A reconstructed panoramic, axial, buccolingual CT scan was carried out in the lower third molar area. On the panoramic images (Fig. 1A), the left bifid mandibular canal was suggested, the right bifid mandibular canal was not obvious. In addition, on the reconstructed CT images (Fig. 1B, 1C), the mandibular canal in left side was raised from the single mandibular foramen and then immediately bifurcated, and the upper canal narrowed along the third molar after bifurcation. The root of # 38 was attached to the the bifid mandibular canal.

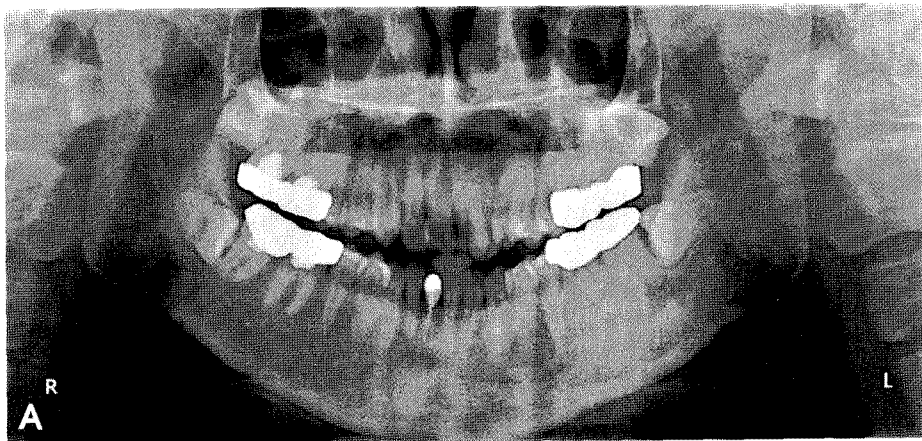
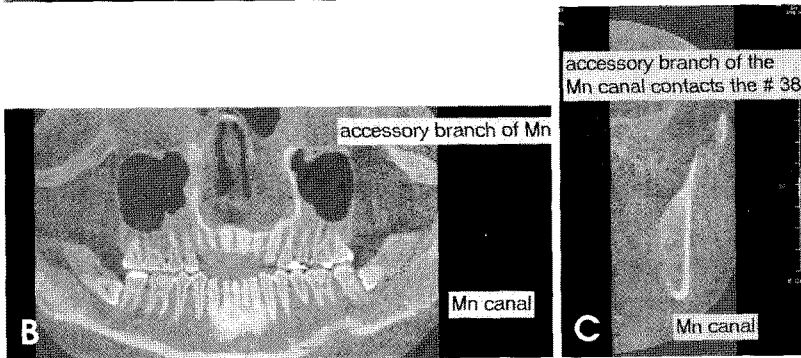
#### Case 2

A 23-year-old man was referred to the radiologic department

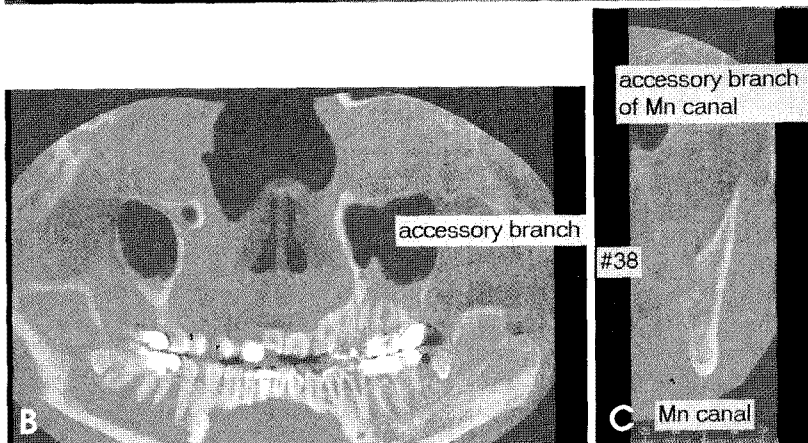
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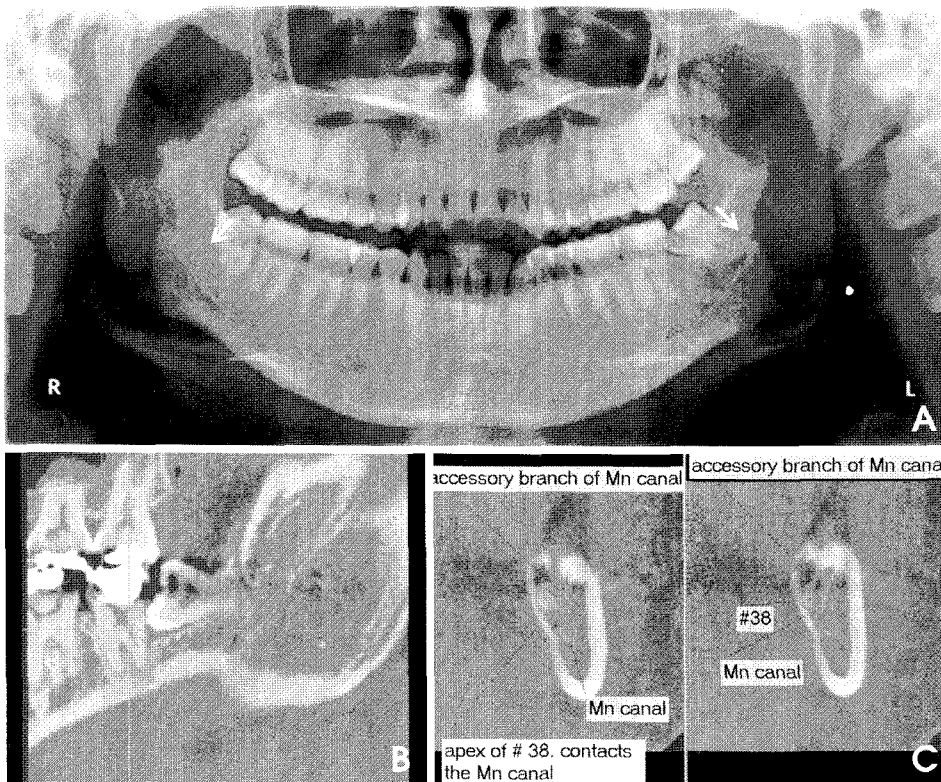


**Fig. 1.** A, Panoramic radiograph shows left bifid mandibular canal (branch canal) near the root of the left mandibular third molar. B, C, Panoramic and cross-sectional CT images on dental program. The upper branch canal is narrow and running beneath the roots (#38).

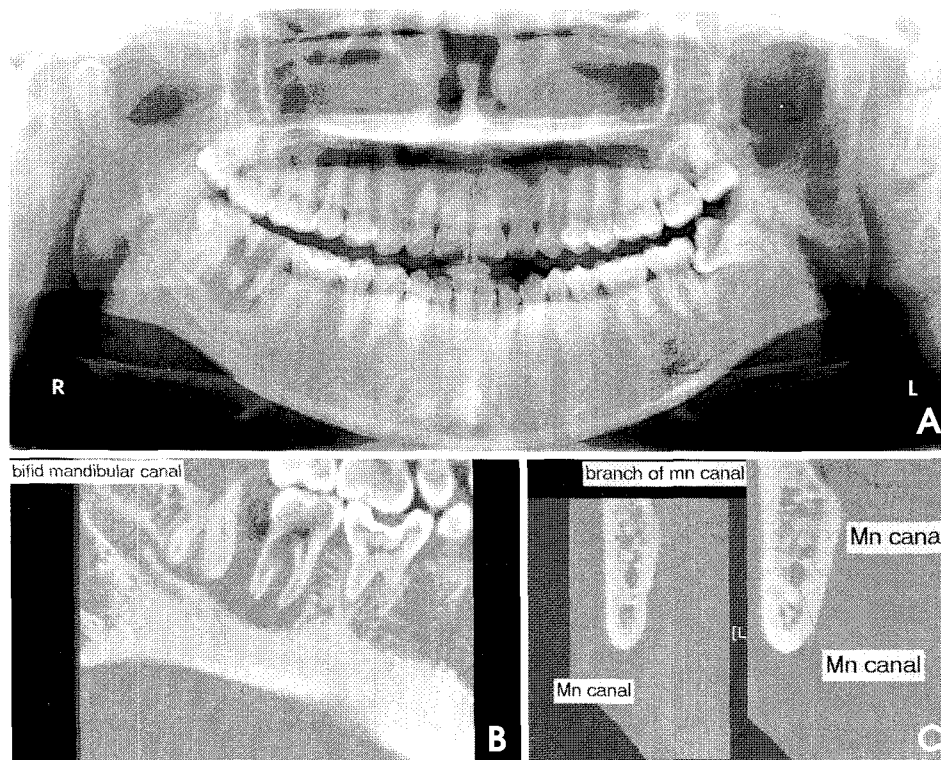


**Fig. 2.** A, On the panoramic image, it is hard to detect any bifid mandibular canal. B, C, CT images show narrow upper branch canal along the roots (#38).





**Fig. 3.** A, Panoramic radiograph shows left bifid mandibular canal. B, C, CT images show narrow upper branch canal running vertically to the roots (#38) and reaching to the retromolar region.



**Fig. 4.** A, On the panoramic image, it is hard to detect any bifid mandibular canal. B, C, The upper branch canal is narrow and running beneath the roots (#48).

for evaluation of impacted third molars. A reconstructed panoramic, axial, buccolingual CT scan was carried out in the lower third molar area. On the panoramic images (Fig. 2A), the both

bifid mandibular canal was not obvious. On the reconstructed CT images (Fig. 2B, 2C), the mandibular canal in left side was raised from the single mandibular foramen and then immediate-

ly bifurcated, and the upper canal narrowed along the third molar after bifurcation. The root of # 38 did not contact the bifid mandibular canal.

### Case 3

A 31-year-old woman was referred to the radiologic department for evaluation of impacted third molars. A reconstructed panoramic, axial, buccolingual CT scan was carried out in the lower third molar area. On the panoramic images (Fig. 3A), the both bifid mandibular canal was suggested. On the reconstructed CT images (Fig. 3B, 3C), the mandibular canal in the left side was raised from the single mandibular foramen and then bifurcated, and narrowed upper canal coursed forward at first, reaching the retromolar region.

### Case 4

A 26-year-old woman was referred to the radiologic department for evaluation of dentoalveolar abscess of # 47 and third molar in the right mandible. A reconstructed panoramic, axial, buccolingual CT scan was carried out in the lower third molar area. On the panoramic images (Fig. 4A), the both bifid mandibular canal was not obvious. On the reconstructed CT images (Fig. 4B, 4C), the mandibular canal in right side was raised from the single mandibular foramen and then immediately bifurcated, and the upper canal narrowed along the third molar after bifurcation. The apex of # 48 was attached to the bifid mandibular canal.

## Discussion

The location and configuration of mandibular canal variations are important in dental surgical treatment.

The occurrences of bifid mandibular canal have been reported as 0.35% by Sancbis et al.<sup>5</sup> 0.9% by Nortje et al.<sup>7</sup> and 0.95% by Langlais et al.<sup>3</sup> used panoramic surveys. Klinge et al.<sup>8</sup> reported that mandibular canal of specimen cadavers was not visible in 36.1% of panoramic radiographs. The bifid mandibular canal could be detected on conventional panoramic image in half of the our cases (2 cases out of four). The bifid canal be better recognized on CBCT images. Naitoh et al.<sup>1</sup> reported 65% of the bifid mandibular canal detection using CBCT. They included all the branch canal supply to the third and/or second mandibular molars detected on CBCT images. CBCT has some advantages regarding image quality compared to panoramic image.

The various types of bifid mandibular canals have been classified according to anatomical location and configuration.<sup>1,3,7</sup> Our cases of bifid mandibular canals originated from the superior wall of the mandibular canal. Naitoh et al.<sup>1</sup> classified 4 type of bifid mandibular canals using the CBCT images. According to the the Naitoh's classification, our 3 cases (case 1, 2, 4) corresponded to type 2 (dental canal), and 1 case (case 3) corresponded to type 1 (retromolar canal).

Case 1 and 4 showed the bifid mandibular canal reaching the root apex of the third molar. When third molar surgery has to be carried out, extreme care must be used when there are bifid canals to the molar area. The tooth may infringe on or be within the canal itself. As a second neurovascular bundle may be contained within the bifid canals, complications such as traumatic neuroma, paraesthesia, and bleeding could arise because of failure to recognize the presence of this anomaly and its complications.<sup>2</sup> Recently, the retromolar region was used as a donor site for harvesting bone blocks.<sup>9</sup> To safely harvest bone blocks from the retromolar region, preoperative imaging using CBCT may be needed.<sup>1</sup> Using the CBCT images help clinicians in diagnosis and treatment planning of surgical procedures in the mandible and attribute to fewer complications during treatment.

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