

Three cases of cholesterol granuloma in the mandible

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ABSTRACT

Cholesterol granuloma is an unusual clinical entity described as an inflammatory granulation in response to the deposit of cholesterol crystals. It can develop in any portion of air cells within the temporal bone as a result of a lack of aeration and inadequate drainage, especially in the middle ear cavity. Here, we report very unusual three cases of cholesterol granuloma developed in mandible. In the first case a 68-year-old male with a large mass arising from the mandible was observed. Panoramic radiograph and computed tomography scans revealed a huge expanding lesion in the mandible. In the second case a 47-year-old female with a cystic lesion in the mandible was observed. And in the third case a 19-year-old male complaining atypical facial pain had a large lesion in the mandibular ramus. The histopathologic examinations of the cases showed numerous cholesterol crystals surrounded by multinucleated foreign body giant cells. (*Korean J Oral Maxillofac Radiol* 2007; 37 : 225-30)

KEY WORDS : Cholesterol Granuloma; Mandible; Diagnostic Imaging

Cholesterol granuloma is a histopathological entity caused by a foreign body reaction against cholesterol crystal.¹ Cholesterol granulomas show a typical histological picture of granulomatous tissue with cholesterol clefts surrounded by fibroblasts, macrophages and foreign body giant cells.²⁻⁵ It is usually associated with chronic middle ear diseases and is commonly in the mastoid antrum and air cells within the temporal bone.⁶ The pathogenesis of cholesterol granuloma is still unclear, but the most likely cause is obstruction of ear drainage in the middle ear.^{1,7} Disturbance of air drainage would result in negative pressure in the air cavity secondary to absorption of air into mucosa. As a result, mucosal edema and hemorrhage might occur. Hematoma from the mucosal bleeding would not be absorbed, resulting in its conversion to cholesterol crystals. The deposited cholesterol crystals act as an irritant which attracts foreign body giant cells and causes fibrosis.^{3,4}

As expected by the pathogenesis, cholesterol granuloma is very uncommon in the mandible because the mandible does

not have any pneumatized space. To our knowledge, three cases in the mandible have been reported in the english literature.

The purpose of this report is to describe new three cases of cholesterol granuloma in the mandible.

Case reports

Case 1

A 68-year-old man was referred complaining the discomfort of the left mandibular area which had begun about 2 years before.

A panoramic radiograph revealed a well-defined and multilocular radiolucent lesion expanding from symphysis area to the left mandibular sigmoid notch. Horizontally impacted left third molar was included in the lesion and the teeth nearby the lesion showed loss of lamina dura and root resorption (Fig. 1A).

CT scans showed the cortical thinning and expansion at the anterior border of the left ramus, left sigmoid notch, and the anterior region of the left mandibular angle. The inner surface of the left mandibular ramus was also markedly expanded (Fig. 1B-D).

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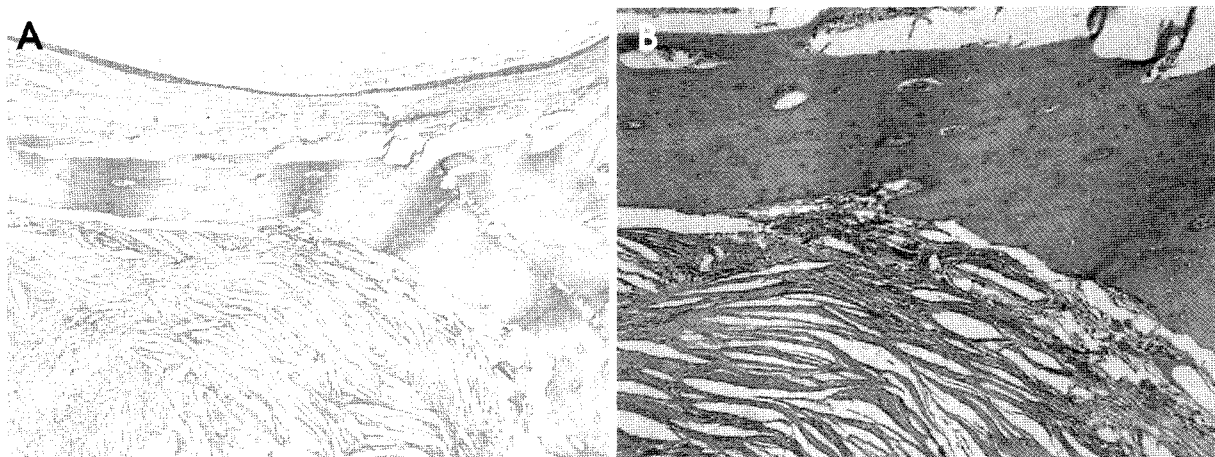
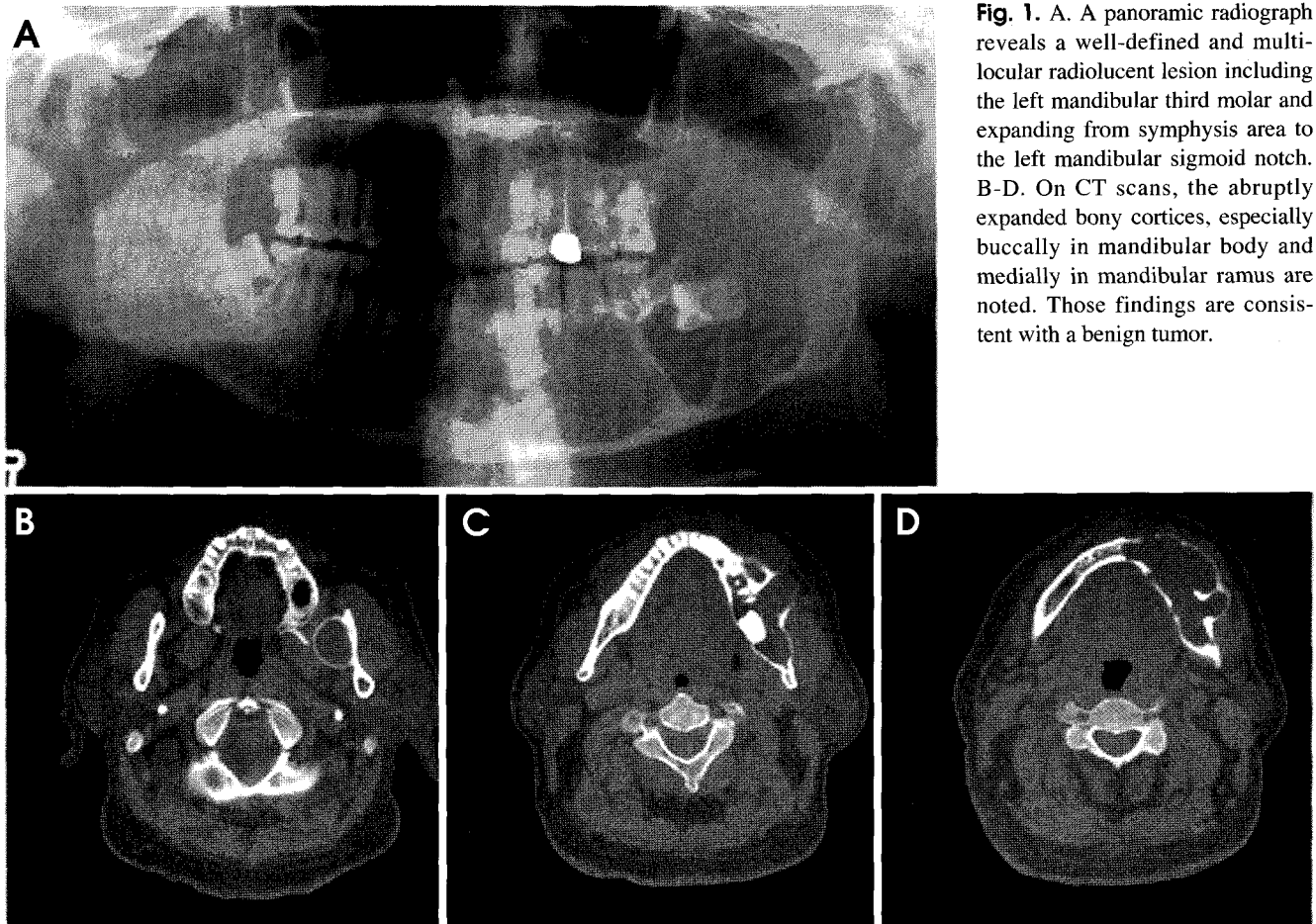


Fig. 2. A. A part of a cavity lined with epithelium and surrounded by normal bone matrix is shown. A large number of cholesterol clefts appear to resorb the bone matrix (HE stain, $\times 40$). B. Photomicrograph revealing cholesterol clefts surrounded by multinucleated giant cells which resorb the surrounding bone (HE stain, $\times 100$).

The lesion was tentatively diagnosed as ameloblastoma. A hemimandibulectomy followed by a fibular reconstruction was performed under general anesthesia. A biopsy was performed, and a diagnosis of cholesterol granuloma was made.

On histopathologic examination, the resected tissue was composed of two parts. The anterior part in the body of mandible was filled with a muddy, greyish brown granulomatous mass. The posterior part in the mandibular ramus and coronoid

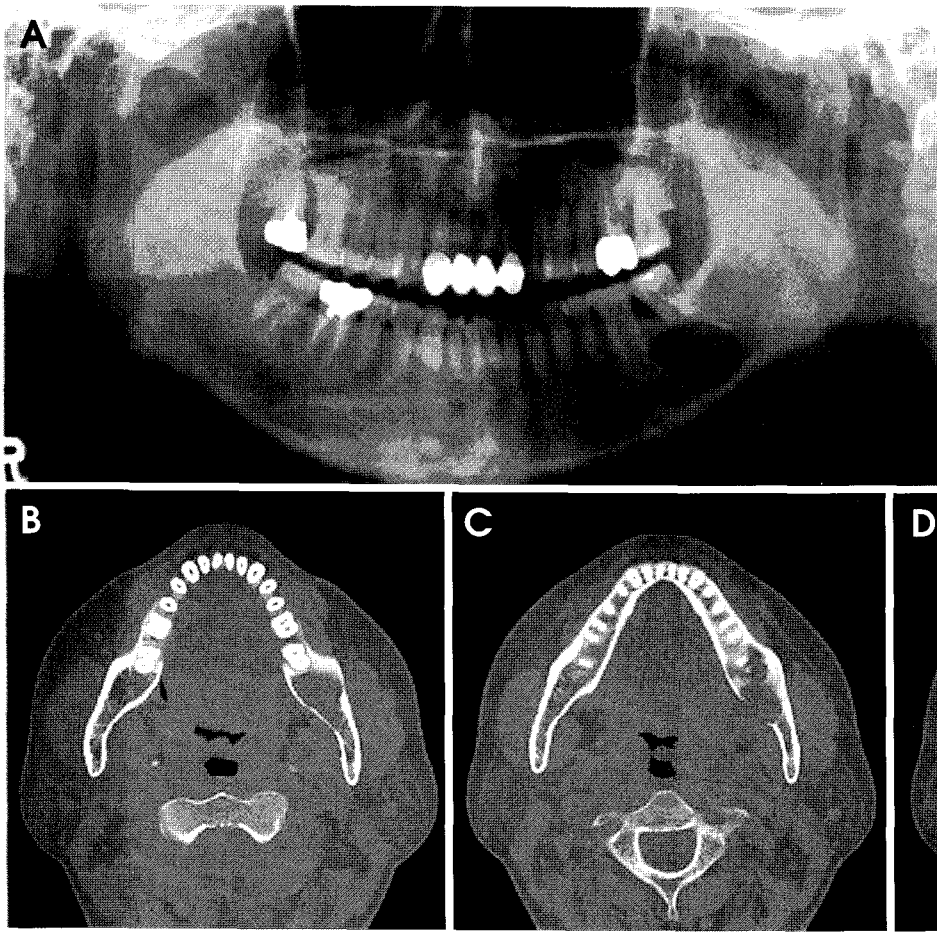


Fig. 3. A. A panoramic radiograph reveals a well-defined and bilocular radiolucent lesion in the left mandibular body and ramus. Note the external root resorption of the left mandibular second molar. B-D. On CT scans, thinning and partial discontinuity of the lingual cortex are observed.

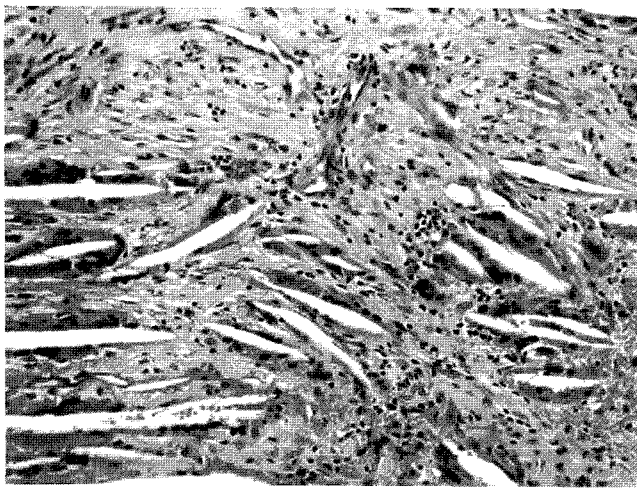


Fig. 4. Photomicrograph of patient 2 surgical specimen (HE stain, $\times 100$) revealing a large number of spindle-shaped cholesterol crystals surrounded by multinucleated giant cells and hemosiderin deposits.

process appeared as a cavity lined with epithelium, containing the left lower second molar in it (Fig. 2A). The whole resected

mass was $10.5 \times 7.5 \times 3.5$ cm in size, and the greyish brown granulomatous mass in the anterior part was 6.0×3.0 cm in size. The microscopic examination revealed numerous crystal clefts of cholesterol surrounded by multinucleated giant cells causing bone resorption (Fig. 2A-B).

Case 2

A 47-year-old woman was referred, found on the routine radiographic examination, with a lesion of the posterior mandibular body.

A panoramic radiograph revealed a well-defined and radiolucent lesion expanding from the left mandibular second molar region to the left mandibular ramus. The left mandibular second molar showed external root resorption (Fig. 3A).

CT scans showed thinning and partial discontinuity, but didn't show an obvious expansion of mandibular cortex (Fig. 3B-D).

The lesion was tentatively diagnosed as odontogenic keratocyst and was enucleated. It was revealed as a cholesterol granuloma histopathologically.

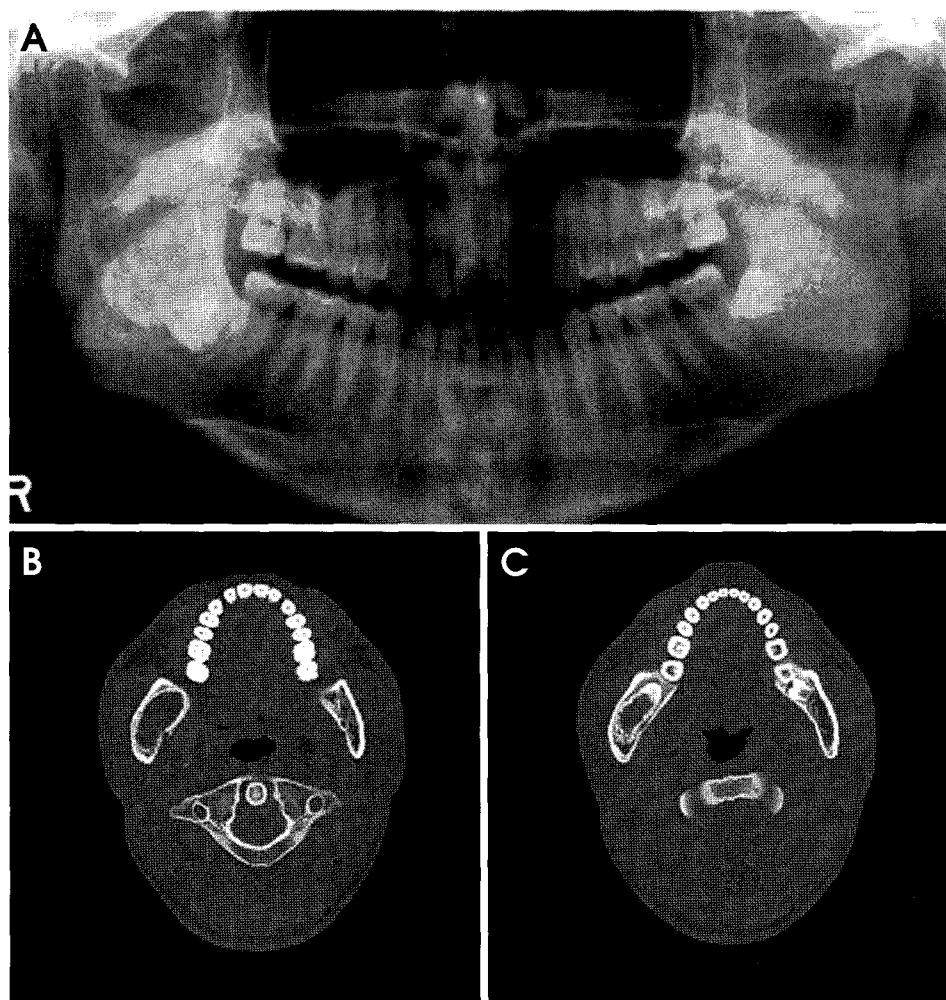


Fig. 5. A. A panoramic radiograph shows a well-defined and unilocular radiolucent lesion with sclerotic border in the right mandibular ramus, which included the third molar. B-C. On CT scans, the thick and sclerotic border surrounding the lesion connected to the tooth germ and minimal bony expansion are noted.

A greyish brown granulomatous mass was enucleated. The enucleated mass was $1.5 \times 1.5 \times 0.8$ cm in size. Microscopic examination revealed numerous crystal clefts of cholesterol embedded between red blood cells (Fig. 4).

Case 3

A 19-year-old man was referred with atypical facial pain from the department of neurology. He complained of pain on his teeth, tongue, eyes, and the backside of the neck. The symptom had begun about 5 years before.

A panoramic radiograph and CT scans showed a well-defined and unilocular radiolucent lesion with sclerotic border at the right mandibular ramus, which included the third molar (Fig. 5A-C).

Radiographically the lesion was thought to be an odontogenic benign lesion. Developing odontoma, ameloblastic fibro-odontoma, and nonossifying fibroma were considered in the differential diagnosis. The lesion was enucleated and a biopsy

was performed. A diagnosis of cholesterol granuloma was made.

The enucleated mass was composed of several pieces of bone and soft tissue. The largest piece of bone was $2.5 \times 2.5 \times 1.0$ cm in size, and the largest piece of soft tissue was $2.8 \times 0.8 \times 0.6$ cm in size. The histological examination of sections stained with Hematoxylin and Eosin showed a mass without epithelial lining and numerous needle-like spaces representing the accumulation of cholesterol crystals were revealed (Fig. 6). A large number of multinucleated foreign body giant cells surrounded these cholesterol clefts. Small areas of hemorrhage, macrophages and other chronic inflammatory cells were found. These pathological findings were consistent with those of cholesterol granuloma.

Discussion

Cholesterol granulomas occur commonly in any of the air

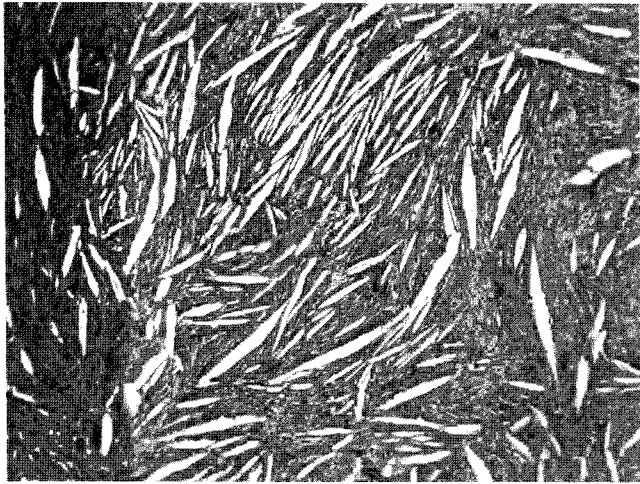


Fig. 6. Photomicrograph of patient 3 surgical specimen revealing a large number of spindle-shaped cholesterol crystals surrounded by multinucleated giant cells and hemosiderin deposits (HE stain, $\times 100$).

cells of cranial bones such as in the middle ear cavity, mastoid process and petrous apex in the temporal bone, and frontal and maxillary sinuses.^{2,8-14}

Cholesterol granulomas that are found generally in the mandible usually appear as small apical lesions in panoramic radiographs. There are few cases that a cholesterol granuloma appears as an independent and extensive lesion. To our knowledge, three cases have been reported under the term cholesterol granuloma in the English literature. Hirshberg et al.³ reported a cholesterol granuloma of the mandible, which manifested as a solitary round radiolucent lesion in an edentulous area. Two other cases in the mandible showed a small cystic lesion.^{15,16} But the present cases showed larger and expansile lesions. They presented as a unilocular or multilocular radiolucent lesion resembling odontogenic keratocyst or benign tumor in radiographs. To the best of our knowledge, such an extensive lesion in the mandible diagnosed as cholesterol granuloma have not been reported previously.

Although CT scans of cholesterol granuloma provide more detailed information, MRI is also known to provide appropriate information. Generally, cholesterol granuloma shows a strong high signal intensity on T1-weighted images but is not enhanced with gadolinium injection. Moreover, since it also shows a high signal intensity on T2-weighted image due to its high lipid cholesterol content, a cholesterol granuloma can be distinguished from other diseases such as epidermoid cyst, cholesteatoma, chondroma, chondrosarcoma, or mucocele.¹⁷⁻¹⁹ However, the final diagnosis of this lesion depends on the histological examination.

In case 1, the anterior part of the resected specimen of the mandible brought for a biopsy was entirely filled with cholesterol granuloma and the bone seemed to be resorbed by the multinucleated giant cells surrounding the cholesterol clefts. Therefore we can assume that the mass of cholesterol granuloma itself made the lesion erode and expand the surrounding bone. On this assumption, the term cholesterol granuloma might be used as an independent pathologic entity.

Sometimes it is confusing to distinguish cholesterol granuloma from cholesteatoma. Cholesterol granuloma is a granulomatous structure formed through non-specific foreign-body reaction to cholesterol crystals which are product of blood breakdown. Cholesteatoma, on the other hand, is formed by accumulation of keratin, the epithelial residue of embryonal origin.^{17,20,21} It is a cystic cavity lined by keratinized squamous epithelium and surrounded by a stroma of variable thickness. The microscopic diagnosis depends entirely on the presence and identification of squamous epithelium and/or laminated keratinized material.^{3,4,22} Thus, the use of the term cholesteatoma for a mass of connective tissue with cholesterol crystals but without epithelial components and keratin, should be avoided and replaced by cholesterol granuloma.

At the present time, cholesterol granuloma does not represent an independent pathologic entity and it is believed to be caused by secondary bleeding in the pre-existing lesion of the mandible. Thus, the term is used to describe a tissue response to cholesterol crystals, mainly within the cranial bones.^{2,8-11}

The reason for destruction of red blood cell and the subsequent initiation of cholesterol granuloma is yet unknown. But if the pathogenesis of cholesterol granuloma of the mandible is elucidated, there is a possibility of it being used as an independent entity. Further studies are needed on the cholesterol granuloma of the mandible.

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