Stafne's bone cavity

Classification based on outline and content determined by computed tomography

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Fifteen cases (16 concavities) of the so-called "Stafne's bone cavity" were investigated with the use of computed tomography. The sizes, bony outlines, and contents were analyzed on axial images. In all cases, computed tomography clearly demonstrated the concavities on the lingual surface of the mandible. There were no empty concavities. The bony outlines and contents were divided into three types. The concavities with a portion of submandibular gland as a content were larger than those with other contents. Four of six concavities not extending to the buccal cortical plate were filled solely with fat tissue, whereas all concavities with expansion of the buccal cortical plate contained submandibular gland. **(ORAL SURG ORAL MED ORAL PATHOL 1993;76:375-80)**

In 1942, Stafne[1] first described 34 cases of a radiographic abnormality just anterior to the mandibular angle. Such abnormalities showed oval or elliptical radiolucencies with well-defined, denser and thicker walls than those seen in odontogenic cysts. Since Stafne's report, in which he used the term *bone cavity*, many radiologic and surgical investigations of this abnormality have been reported using various synonyms, namely, cavity,[2-10] defect,[11-24] cyst,[25-27] concavity,[28, 29] depression,[30-32] or some other designation.[33-35] Now, this condition is well recognized as a developmental concavity occasionally found on the lingual surface of the mandible.

Although various etiologic considerations have been proposed, the cause and pathogenesis are still uncertain. The contents of the concavity have been investigated surgically. The majority contained a portion of salivary gland,* followed by fat,[4, 24] and connective tissues.[4, 26] On the other hand, some reports indicated that no contents were seen on surgical exploration.[2, 4, 18, 23, 28]

A few authors[7, 9] have reported computed tomography (CT) findings of this concavity but not in detail. The aim of this article is to clarify the CT findings and to investigate its use in exploring the contents of the concavity without surgery.

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*Refs. 5, 11, 12, 15, 16, 22, 25, 27, 29.

MATERIAL AND METHODS

Fifteen patients with the so-called Stafne's bone cavity were examined with CT at the Department of Oral and Maxillofacial Radiology of Kyushu University Dental Hospital from 1985 to 1992. All concavities exhibited the typical radiologic appearance of this abnormality on the conventional films. Fourteen patients had one concavity and the remaining patient had two concavities on the same side. Therefore a total of 16 concavities were investigated (Table I). The 15 patients (12 men, 3 women) ranged in age from 34 to 75 years (mean, 50.9 years). All were examined with Somatom DR (Siemens AG, Erlangen, Germany). Axial scans parallel to the inferior border of the mandible were obtained in 2 or 4 mm contiguous sections. CT-sialography of the submandibular gland was also performed in six patients.

The size and outline of the concavities on axial CT image were investigated in relation to the surrounding structures. The depth was measured as the maximum distance from the lingual surface to the bottom of the concavity and the width as the maximum mediodistal distance. The contents of the concavities were examined with respect to CT value (Hounsfield units, HU) and the findings of CT-sialography. The relationship between the size, outline, and contents were analyzed.

RESULTS

CT scans clearly demonstrated the concavity on the posterior lingual surface of the mandible. All 16 concavities opened on the lingual surface of the mandi-

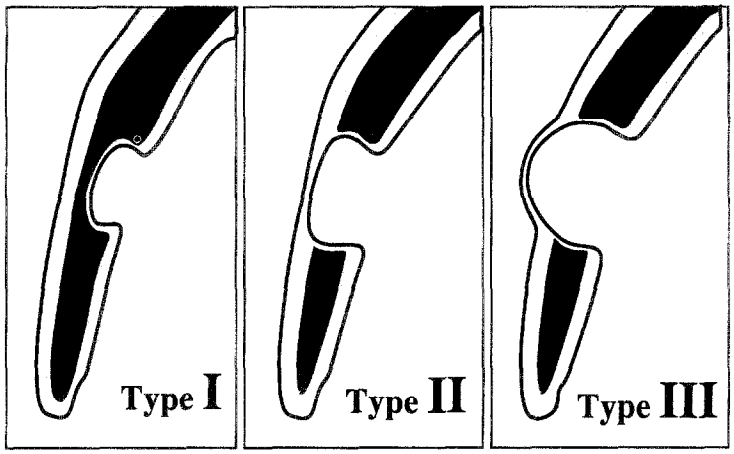

Fig. 1. Classification of concavities according to their outline and relationship to buccal cortical plate.

Table I. Summary of cases

Case number	*Age (yr.)*	*Sex*	*Side*	*Examination modality*	*CT images*			
					Size† (mm)		*Outline‡*	*Content*
					Depth	*Width*		
1	34	Man	Left	CT	7	17	I	Fat tissue
2*	53	Man	Left	CT, CT-sialography	8	7	I	Fat tissue
3	56	Man	Left	CT	5	7	I	Fat tissue
4	63	Man	Left	CT	5	10	I	Fat tissue
5	54	Woman	Right	CT	8	18	I	Soft tissue
6	47	Woman	Left	CT	7	10	I	Soft tissue
7	57	Man	Right	CT	6	10	II	Fat tissue
8	75	Man	Right	CT	5	12	II	Soft tissue
9	34	Man	Left	CT	9	18	II	Submandibular gland
10	48	Man	Left	CT, CT-sialography	6	18	II	Submandibular gland
11	51	Man	Right	CT, CT-sialography	8	15	II	Submandibular gland
12	51	Man	Right	CT, CT-sialography	10	25	II	Submandibular gland
13	61	Man	Right	CT	5	16	II	Submandibular gland
14	36	Man	Right	CT, CT-sialography	18	23	III	Submandibular gland
15	44	Woman	Right	CT, CT-sialography	10	24	III	Submandibular gland
16*	53	Man	Left	CT, CT-sialography	10	22	III	Submandibular gland
Average	50.9				7.9	16.3		

*Same Patient
†Depth-maximum buccolingual distance. Width-maximum mediodistal distance.
‡Types of outline are shown in Fig. 1.

ble within the area surrounded by the mylohyoid line, the anterior attached portion of the medial pterygoid muscle, and the inferior border of the mandible. The depth and width of the concavities averaged 7.9 and 16.3 mm respectively.

The concavities were divided into three types according to their outline and relationship to the buccal cortical plate (Fig. 1). In the first type (type I), the bottom of the concavity did not reach the buccal cortical plate (Fig. 2). In the second (type II), it reached the buccal cortical plate, but there was no expansion or distortion of the plate (Fig. 3). The third type (type III) was characterized by a buccal expansion of the cortical plate (Fig. 4). Six cases showed type I, seven showed type II, and three cases showed type III.

There were no empty concavities. The concavities were also divided into three types according to their contents as determined by axial CT analysis (Fig. 5). Five cases were classified as type F, that is, the concavity was filled with only fat density (the CT values varied from −50 to −200 HU) (Fig. 2). Three were classified as type S, with a density of soft tissue structure suggesting a lymph node, vessel, connective tissue, or others (Fig. 6). In type G, the submandibular

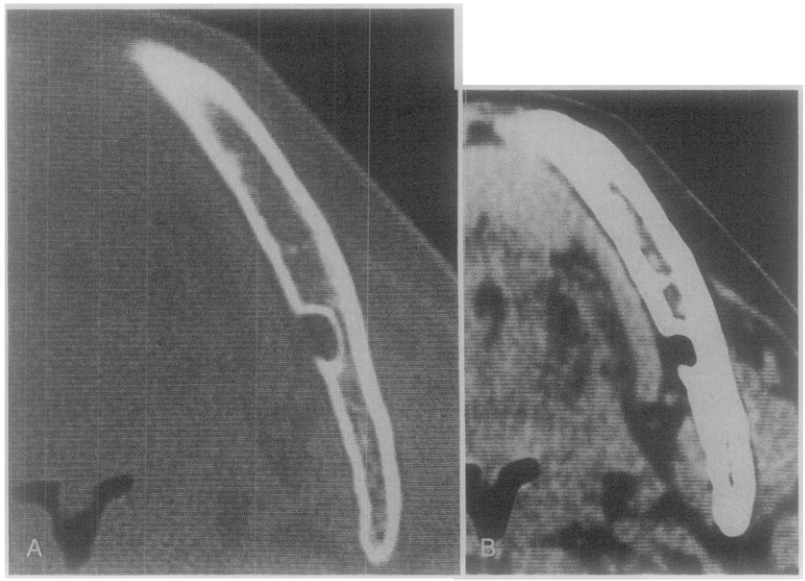

Fig. 2. Axial CT images of case 3. **A,** Bottom of concavity does not reach buccal cortical plate. **B,** Soft tissue image clearly shows that concavity is occupied with only fat tissue density. CT value of content was −130 HU.

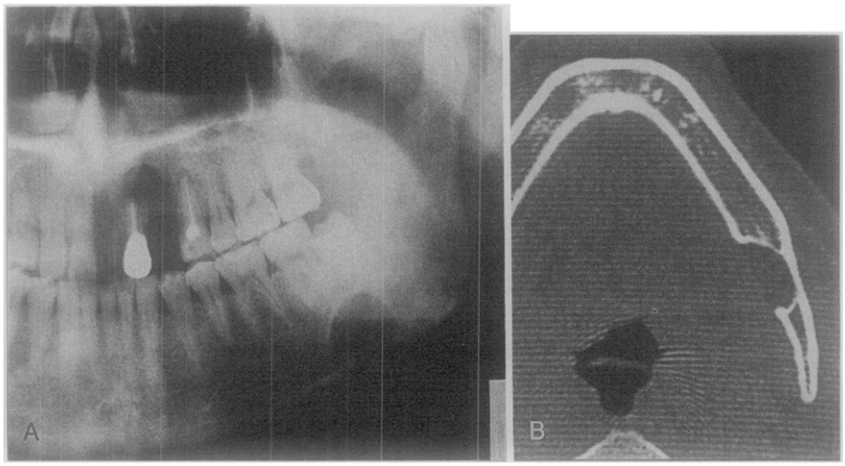

Fig. 3. **A,** Panoramic radiograph of case 9 shows typical appearance of Stafne's bone cavity near angle of mandible on left side. **B,** Axial CT image shows that bottom of concavity reaches buccal cortical plate, which is not expanded.

gland was entrapped in or was located close to the concavity (Fig. 4). This special relationship between the concavity and the submandibular glands was observed in eight cases, six of them were confirmed by CT-sialography.

Four of the type I concavities contained only fat tissue whereas the remaining two were occupied by other soft tissues (Table II). Five of the seven type II concavities contained submandibular gland tissue and two were filled by fat or soft tissue. The three type III concavities all contained submandibular gland tissue. The mean depth was 6.2, 6.7, and 9.5 mm and the mean width was 10.2, 13.3 and 20.1 mm in types F, S, and G, respectively. Difference in mean width between type F+S (11.4 mm) and Type G (20.1 mm) was statistically significant with $p < 0.01$ level by t test.

DISCUSSION

The so-called Stafne's bone cavity has been established as a clinical entity by many radiologic and surgical studies. The age and sex distributions of our patients were almost equal to those of previous reports.[6, 7, 19, 20] Because of the typical appearance and

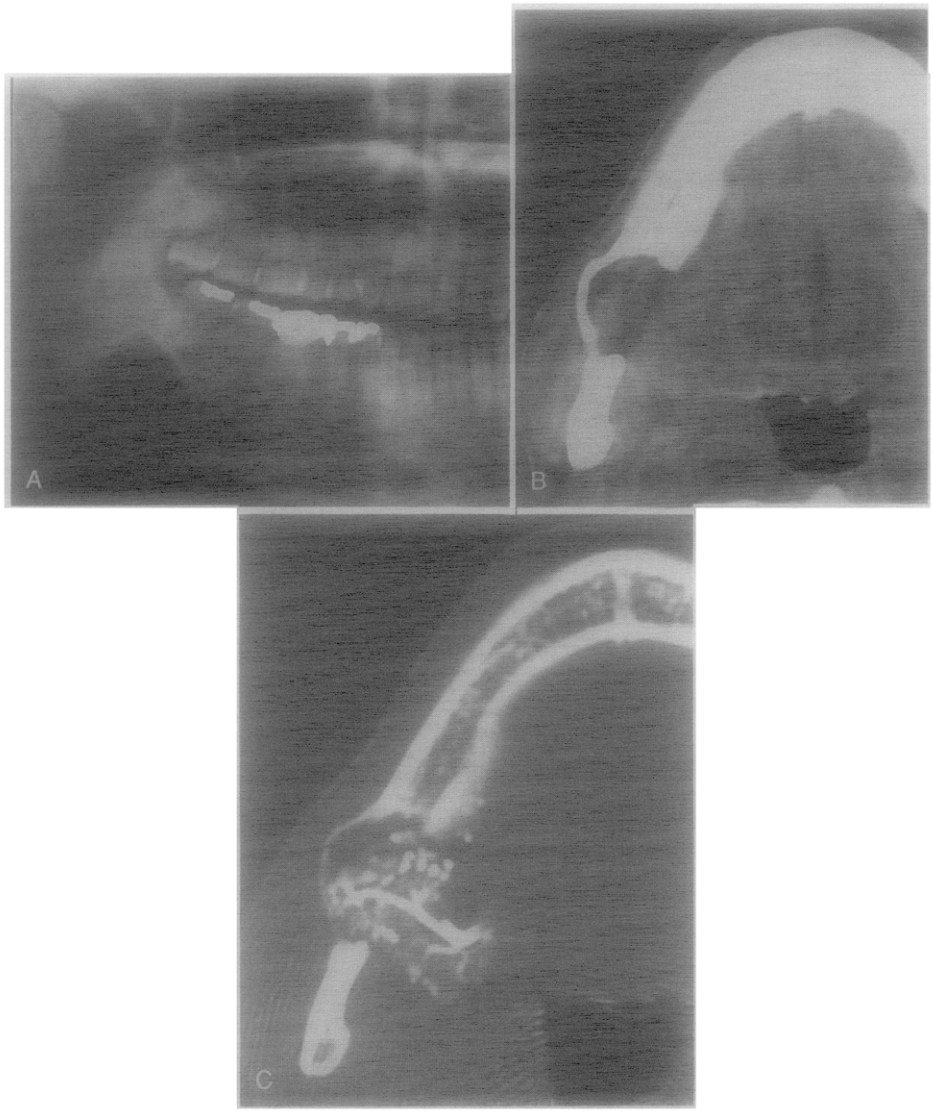

Fig. 4. **A,** Panoramic radiograph of Case 14 shows large radiolucent lesion on right side of mandible. **B,** Buccal cortical plate extremely expanded laterally. **C,** Entrapped submandibular gland was confirmed by CT-sialography.

Table II. Relationship between the types of outline and content

Type of content	*Type of outline*		
	I	*II*	*III*
F	4	1	0
S	2	1	0
G	0	5	3

Arabic numbers = number of concavities

location of the concavities, the diagnosis is often based on panoramic radiography. However, the most important key to the diagnosis is to demonstrate that the concavity is open on the lingual surface of the mandible with a cortical lining. Although occlusal and tangential projections are sometimes useful in this respect,[19, 20] axial CT depicts the outline of the concavities in a horizontal plane better than any other radiologic procedure. In particular, CT may be most important for interpretation of the more anteriorly positioned concavities located above the mylohyoid line as they are often confused with periapical lesions and are usually not definitively diagnosed until after surgical intervention.[22, 24, 28, 29] With the aid of CT, surgery can be avoided.

The contents of the concavities have been controversial. As reported by Choukas and Toto,[11] there are difficulties in confirming the contents by surgery. They reported that concavities may appear empty as

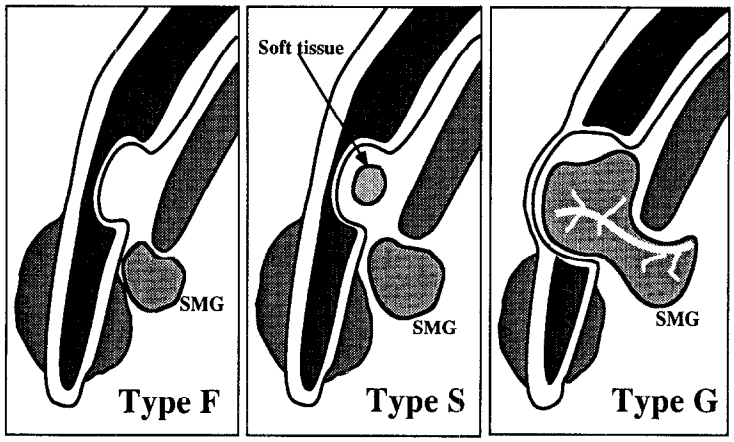

Fig. 5. Classification of concavities according to their contents. (SMG-submandibular gland.)

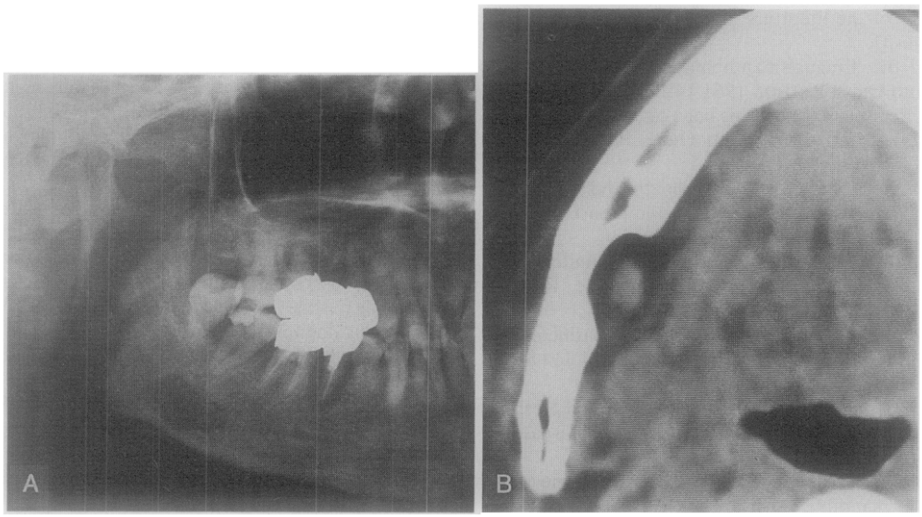

Fig. 6. **A,** Panoramic radiograph of case 5 reveals elliptical radiolucency on right side of mandible; density is higher than that of case 14 shown in Fig. 4. **B,** Axial CT image shows small soft tissue density mass in concavity. Bottom of concavity does not reach buccal plate.

a result of dislodgement of the entrapped portion of the submandibular gland during the surgical procedure. Choukas[16] added that the findings of connective, lymphoid, or muscular tissue in previous reports very probably indicate that the biopsy specimen was taken from surrounding tissue in the submandibular space and not from the concavity itself. Our results support Choukas' view because there were no empty concavities in our patients. On the other hand, our observations do not lend support to his statement that submandibular gland tissue is the only soft tissue that can exist in the concavities. It seems that any surrounding soft tissue could be entrapped in the concavities. CT value helps to determine the content.[8] Fat tissue can be easily verified as it is the only tissue that has the CT value below −50 HU in this region.[36]

With respect to the origin of the concavities, the most widely adopted view is that the concavity develops through continuous pressure from adjacent structures, such as the submandibular gland* or facial artery.[20, 26] However, there are those who believe that the concavities represent a congenital defect[1, 25, 27, 33] or are caused by localized bone atrophy as a result of ischemia.[23] On the basis of our results, it is possible to negate one of these theories, that submandibular gland position is the only cause of the concavity.[11, 15, 16, 18] Although it seems true that the concavity is a developmental anomaly,[10] it may have multiple origins because similar concavities were reported with various contents and in the buccal surface[37, 38] as well as the lingual surface. In allowance with the relationship between the outline and content, the find-

*Refs. 11, 12, 15, 16, 22, 29, 34.

ings of cortical expansion (type III concavity) may indicate that the concavity has a possibility of enlargement and that it is brought from entrapping of the submandibular glands. It is noteworthy that the type G concavity had larger width than those of type F+S. This result also indicates that the submandibular gland has something to do with the process of enlargement of the concavity. Finally, we would like to propose that this abnormality, which exhibits the similar radiographic appearances, could be classified into two different entities according to its relationship to the submandibular gland.

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