

Computed tomographic features in muco-pyocoeles of the maxillary sinus

*Toshio Ohnishi, Yuichi Shirahata, Satoru Hongoh and Tomikazu Mizuno,
Tokyo, Japan*

SUMMARY

Radiological images of muco-pyocoeles of the maxillary sinus often simulate those of malignancy. This presents a diagnostic dilemma for rhinologists. The authors studied the computed tomographic findings of 13 cases of muco-pyocoeles of the maxillary sinus by obtaining two different images, one of the soft tissues and the other of the bony structures.

The bony sinus walls are distended and thinned in many cases by long-standing intramural pressure. The most reliable finding in the diagnosis of muco-pyocoeles is the smooth clear-cut margins of bone erosions occurring in the sinus walls.

Mucocele of the maxillary sinus is rare, except as a complication of sinusectomy. The plain radiographic changes, particularly in the presence of bone defects, may be confused with those of malignancy of the paranasal sinuses. Tomographs can show the shape of the mass and extent of bony erosions, but they are often unsatisfactory for differential diagnosis. The authors studied computed tomographic findings in mucocoeles and pyocoeles of the maxillary sinus in an attempt to differentiate these conditions from malignancy.

MATERIALS AND METHODS

Thirteen cases of mucocele of the maxillary sinus - two without a history of surgery or trauma, and 11 who had had maxillary sinusectomy - were studied by computed tomography (CT).

Transverse axial sections of the maxillary sinus were obtained parallel to the orbito-meatal line, 15 scans at 5 mm intervals, using a Toshiba TCT6030. The window width used was 800 with the window level at 200 Hounsfield units. Two different calculations were used to demonstrate specifically either bone or soft-tissue, and the resultant images were used to differentiate mucocoeles or pyocoeles from malignancy.

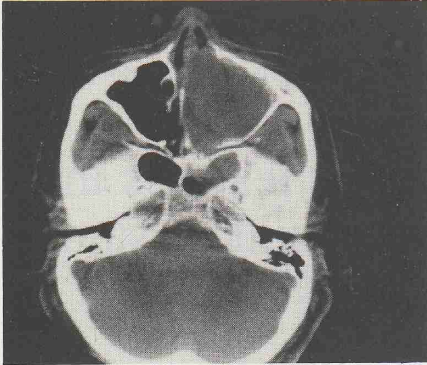


Figure 1. Case 1.
Mucocele developing without a history of sinusectomy or trauma. CT shows complete obliteration of the right antrum, partial absorption of the medial and posterior walls, and bowing of the medial wall.

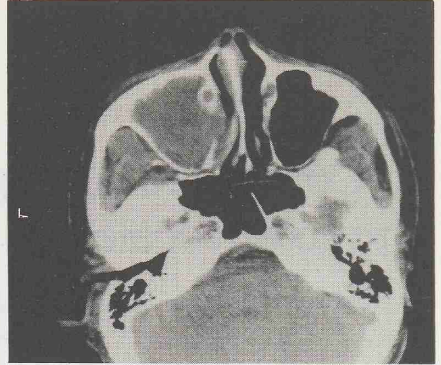


Figure 2. Case 2.
Mucocele developing without previous surgery or trauma. CT demonstrates pronounced opacity of the left antrum and distension and partial absorption of the medial wall. The nasolacrimal duct remains intact.

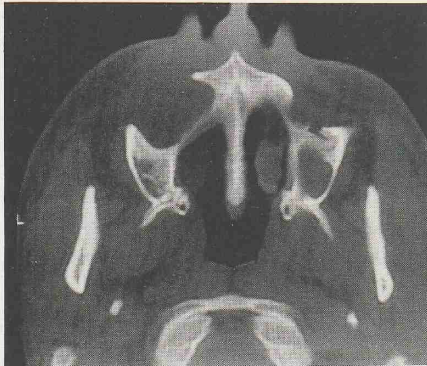


Figure 3. Case 5.
Muco-pyocoele of the left antrum developing 28 years after maxillary sinusectomy. CT shows clear-cut margins of the bone erosions.

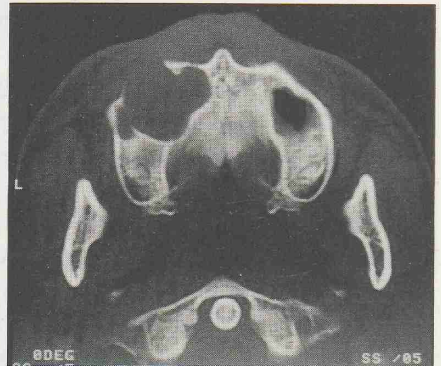


Figure 4. Case 7.
Muco-pyocoele of the left antrum developing 22 years after maxillary sinusectomy. CT shows clear-cut margins of the bony sinus walls.



Figure 5. Case 10.
Muco-pyocoele of the right antrum developing 20 years after maxillary sinusectomy. CT images of the soft-tissue show thick walls and homogeneous contents.

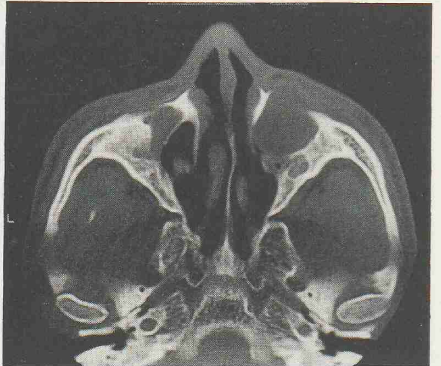


Figure 6. Case 10.
CT of the same case with Figure 5 shows bone absorption at the postero-medial wall of the antrum and smooth margins of the walls.

RESULTS

Of the 13 cases studied, two were idiopathic, with no history of surgery or trauma. Since primary mucocele of the maxillary sinus is rare, these two cases posed a diagnostic dilemma in regard to the differentiation from malignancy. The following is a brief description of the two cases:

Case 1, S.K.

A 55 year-old man with swelling of the right cheek, complete right-sided nasal obstruction and epiphora, was referred to us with a provisional diagnosis of cancer of the maxillary sinus. Conventional radiography showed a marked opacity of the right maxillary sinus and destruction of the medial wall suggesting malignant disease.

Computed tomography (Figure 1) showed partial destruction of the medial and posterior walls. There was also bowing and displacement of the posterior part of the medial wall. In addition, radio-opacity of the right sphenoid sinus, with no evidence of destruction of the anterior wall, was discerned.

Furthermore, the anterior wall of the pterygo-palatine fossa was noted to be damaged, but no soft-tissue infiltration was seen. Maxillary sinusectomy on this patient revealed a large mucocele containing thick brownish fluid. After removal of the tumour, destruction of the medial wall of the sinus was confirmed.

Case 2, S.M.

This was a 39 year-old man with swelling of the left cheek who was referred to us as the swelling increased after a sinus puncture had failed to produce fluid.

Plain radiographs showed an opacity of the left maxillary sinus with bone destruction at the medial wall. Computed tomography (Figure 2) revealed homogeneous clouding of the left antrum and distension of the posterior and medial walls. The nasal fossa showed no soft-tissue mass.

The bony walls of the nasolacrimal duct were intact. Operation on the sinus showed a mucocele with very thick yellowish contents. The bony sinus walls were found to be eroded only at the medial aspect.

The following is a typical case of muco-pyocoles of the maxillary sinus developing years after sinusectomy:

Case 5, K.T.

The patient was a 50 year-old man who had undergone initial sinusectomy for the treatment of chronic sinusitis at the age of 22. He had had a second operation at the age of 28 because of recurrence of symptoms. Swelling of the left cheek developed at 50 years old, when plain radiographs showed clouding of the maxillary sinus.

Computed tomography showed a round mass with a dense rim and smooth clear-cut erosions of the sinus walls (Figure 3). Operation proved the lesion to be muco-pyocoles with thick fibrous walls, together with erosions of the anterior and medial walls of the sinus.

The remaining cases were muco-pyocoles of the maxillary sinus. Each of these patients had had a previous sinusectomy which was thought to be causally related. The ages of the patients ranged from 31 to 52 with the average being 44. A tendency was noted that patients who had had sinusectomy during or before puberty were more likely to develop a mucocele than those who had been oper-

ated upon after puberty. The period between the time of surgery and the development of a muco-pyocoeles was between 11 and 35 years with the average being 25 years. No cases of muco-pyocoeles were found in the elderly. This was presumably due to the diminished secretion of mucus-producing cells that occurs in old age. The CT findings in the 13 cases are summarized in Table 1. Figures 3-6 show CT findings in representative cases. A regular feature is the round or oval shape of the tumour. This seems to be due to slow long-continued secretion from the epithelial layer of the mucocele into its cavity.

Table 1. List of patients and CT findings.

	name	sex	age	age int. surg.	inter- vals	shape	visib. wall	bowing	clear-cut margin	bone erosion	mass- soft T. demarc.
1	S.K.	m	55			irreg.		+	+	+	
2	S.M.	m	39			irreg.		+	+	+	
3	Y.I.	m	31	20	11	round		+	+		
4	H.A.	m	35	18	17	oval	+	+	+		+
5	K.T.	m	50	22	28	oval	+	+	+	+	+
6	M.M.	m	45	20	25	irreg.	+			+	+
7	G.K.	m	46	24	22	oval		+	+	+	+
8	K.K.	m	44	14	30	loculated			+		
9	N.Y.	f	51	25	26	oval		+	+	+	
10	T.O.	m	39	19	20	round	+	+	+	+	
11	T.Y.	f	52	22	30	oval	+	+	+	+	+
12	H.O.	m	45	15	30	irreg.	+	+	+	+	+
13	M.O.	f	48	13	35	oval		+	+	+	
mean			45	19	25		5 (38%)	11 (85%)	12 (92%)	9 (69%)	6 (46%)

The final shape is modified by the surrounding bony walls and the presence of bone erosions. Eight cases showed a round or oval configuration. In the two idiopathic cases the shape of the sinus cavity itself was outlined.

Eleven of the cases showed bowing of the antral walls due to distension from pressure of the slowly enlarging mucocele. Absorption of the bony walls was seen in nine cases, affecting the medial wall in eight. The interior of the mucocele was shown as a homogeneous structure in all cases.

DISCUSSION

Reports on CT findings in mucocoeles of the paranasal sinuses have appeared since 1978. However, these reports have dealt mainly with mucocoeles of the frontoethmoidal or sphenoid sinuses, and only rarely with mucocoeles of the maxillary sinus (Diaz et al., 1978; Hesselink et al., 1979; Prince and Danzuger, 1980). Natvig (1978) reviewed 112 cases of mucocoeles of the paranasal sinuses and only 3% were mucocoeles of the maxillary sinus.

In Japan the incidence of chronic sinusitis is greater than in the West. The frequency of the Caldwell-Luc procedure is also relatively high, hence there is a greater incidence of mucocele or pyocele of the maxillary sinus related to surgery (Iinuma, 1972).

Mucoceles occurring without a history of surgery or trauma, particularly when associated with bone destruction, present a problem of differential diagnosis from malignancy. The problem is even more difficult in cases where previous surgery has resulted in fibrosis and obliteration of the sinus. In these situations plain radiography cannot be relied upon for differential diagnosis.

However, in 1982 when Perugini described the CT characteristics of mucoceles of the paranasal sinuses (other than the maxillary sinus), progress began to be made in this matter. The basic difficulties which had to be resolved, as with plain radiography, were: similar absorption coefficient of malignant and non-malignant tissue; the lack of air contrast in cases of complete obliteration of the sinus; and inability to demonstrate clearly the bony walls of the sinus when these were much thinned or distorted (Matsubara, 1982). The present study was designed to overcome these difficulties by observing the behaviour of the bony walls of the sinus in relation to the mass within it. Two different CT images were obtained to demonstrate, respectively, soft-tissue and bone.

We were able to demonstrate that with a mucocele there is simple dilatation of the sinus, as opposed to destructive changes in malignancy. Also, in mucocele, the soft-tissue scan showed a smooth outline of the mass, a homogeneous structure and absence of infiltration into surrounding structures.

Definitive differentiation from malignancy, however, was provided by high-resolution CT images of the inner bony surfaces of the sinus: in mucocele, the walls had a smooth clear-cut outline; in some cases they showed distension or severe absorption but nonetheless with a smooth margin.

These changes reflect the constant and long-standing pressure from slowly enlarging benign cysts, in contrast to the irregular erosive and destructive changes seen in malignancy. Likewise, a clear line of demarcation was seen in the CT images in six cases where the mucocele had progressed to the extent where it

Table 2. CT differentiation of mucocele from malignancy in the maxillary sinus.

	mucocele	malignancy
configuration	round or oval	irregular shape
walls of the mass	may be visible	nonexistent
intrinsic image	homogeneous	may be enhanced
medial sinus wall	distended or absorbed	eroded or destroyed
margins of bone absorption	smooth and clear-cut	irregular
surrounding soft-tissue	not infiltrated	infiltrated

was in apposition to normal soft-tissue; in malignancy, infiltration of soft-tissue would be expected.

A summary of differential diagnosis by CT between muco-pyocèles and malignancy of the maxillary sinus is given in Table 2.

We believe that the above technique is a reliable and safe method for differentiating benign and malignant tumours of the maxillary sinus.

RÉSUMÉ

Sur les images radiologiques les muco-pyocèles du sinus maxillaire ont souvent l'apparence de malignité. Cela constitue pour les rhinologistes, un dilemme de diagnostic. Les auteurs ont étudié les résultats de tomographie computerisée de 13 cas de muco-pyocèles du sinus maxillaire, à l'aide de deux sortes d'images différentes, l'une des tissus mous et l'autre des structures osseuses.

Dans nombre de cas les parois osseuses du sinus sont distendues et réduites par une pression intramurale de longue date. La constatation la plus fiable dans le diagnostic de muco-pyocèles sont les bords lisses et nets des érosions d'os se présentant dans les parois du sinus.

REFERENCES

1. Diaz F, Latchow R, Duvall AD 3rd. Mucocèles with intracranial and extracranial extensions. Report of two cases. *J Neurosurg* 1978; 48:284-8.
2. Inuma H. The postoperative cysts of maxilla. *Otorhinolaryng Tokyo* 1972; 545-50.
3. Hesselink JR, Weber AL, New PFJ, Davis KR, Roberson GH, Taveras JM. Evaluation of mucocèles of the paranasal sinuses with computed tomography. *Radiology* 1979; 133:397-400.
4. Matsubura K. Application of CT in diagnosing carcinoma of the maxillary sinus. *Nagoya J Med Sci* 1982; 44:69-81.
5. Natvig K, Larsen TE. Mucocèle of the paranasal sinuses. A retrospective clinical and histological study. *J Laryngol Otol* 1978; 92:1075-82.
6. Perugini S, Pasquini U, Menichelli F et al. Mucocèles in the paranasal sinuses involving the orbit. CT signs in 43 cases. *Neuroradiology* 1982; 23:133-9.
7. Prince HI, Danzuger A. Computed tomographic findings in mucocèles of the frontal and ethmoid sinuses. *Clin Radiol* 1980; 31:169-74.

Toshio Ohnishi, M. D.
Dept. of Otolaryngology
St. Luke's International Hospital
Akashicho, Chuo-ku
Tokyo
Japan