



Mucous Retention Cysts in the Paranasal Sinuses: A Retrospective Study

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ABSTRACT

Objectives: To determine the prevalence of retention cysts in the paranasal sinuses and investigate the distribution of mucous retention cysts (MRCs) in the paranasal sinuses.

Materials and Methods:

Between November 2010 and December 2011, a certified radiologist retrospectively reviewed 510 computed tomographic images of the paranasal sinuses ordered by otolaryngologists at Okmeydani Training and Research Hospital. Medical records, endoscopic nasal examinations, MRC size, and cyst: sinus size ratios were evaluated in patients with MRCs. The prevalence and characteristics of MRCs in the paranasal sinuses was determined.

Results:

The prevalence of MRCs was 15.6% (80 cases). The mean age of the patients was 37.6 years, and the male: female ratio was 1.7:1. Seventeen patients had bilateral cysts in the maxillary sinuses and 63 (78.7%) patients had unilateral cysts in the maxillary sinus, and one case each in the left frontal, right frontal, right ethmoid, and right sphenoid sinuses. Cysts were present in more than one sinus in some cases. The mean cyst size in the maxillary sinus was 212 mm². Eight patients required surgery, and all of these patients received Caldwell Luc procedure.

Conclusions:

The prevalence of MRCs was 15.6%. The majority of

cysts were located in the maxillary sinus, followed by the frontal sinuses. Caldwell Luc procedure was performed on all subjects, including those with complicated mucoceles.

Keywords: Paranasal sinus, computed tomography, mucous retention cyst, prevalence.

Introduction:

Paranasal sinuses are air-filled cavities covered by a thin mucous membrane that adheres to the periosteum. They appear on radiographic images as radiolucent oval structures outlined by a thin radiopaque line. Apparent size, radiolucency, shape, and wall thickness may differ according to the radiographic projection used¹⁻³.

Although various definitions of retention cysts have been given, the term refers to any fluid-filled mass with mucoid or serous content that can be detected on a radiographic image. The cyst remains distinct from bone and is surrounded by air within the sinus, except at its base⁴. Thus, on a radiographic image, a retention cyst may appear as a round, dome-shaped, relatively radiopaque lesion originating from the wall of the paranasal sinus⁵. The cyst may be the result of an obstructed seromucinous gland located in the sinus mucosa, in which cystic dilatation of the gland is caused by the accumulation of mucus. The retention cyst grows slowly; the integrity of the mucous membrane is preserved, and its borders are soft and well defined^{6,7}.

Mucous retention cysts (MRCs) generally occur in

the maxillary sinus and are rarely found in the other paranasal sinuses^{6,8,9}. The incidence of maxillary sinus MRCs in the general population ranges from 1.4% to 9.6%¹⁰⁻¹⁶. No previous study has investigated the incidence of MRCs in all paranasal sinuses.

The present retrospective study evaluated the prevalence of MRCs in all paranasal sinuses and determined cyst location, number, and size. Furthermore, we evaluated the indications for treatment and available treatment modalities.

Materials and methods:

Between November 2010 and December 2011, 510 patients were referred to the Okmeydanı Training and Research Hospital for computed tomography (CT) of the paranasal sinuses. Patients were aged 13–57 years (mean, 33.6 years), with the majority aged 20–40 years. The male: female ratio was 1.7:1.

The indication for paranasal CT was chronic rhinosinusitis, classified according to the symptoms described by the Task Force on Rhinosinusitis of the American Academy of Otolaryngology–Head and Neck Surgery¹⁷. Inclusion criteria were: failure to respond to maximal medical treatment, complications of rhinosinusitis, and suspicion of malignancy and nasal trauma. An otolaryngologist ordered CT and a certified radiologist reviewed the images retrospectively. The diagnostic criteria were: (a) a homogeneous dome-shaped cyst with sharp demarcation of the lateral borders, (b) absence of bony destruction, (c) absence of contact with the roots of the teeth (to exclude dentigerous cysts), and (d) a smooth, spherical outline along the free border of the cyst. Cyst location, number, and size were recorded. The size of each retention cyst was measured according to its longest dimension and the cyst: antral size ratio was calculated. In patients with multiple cysts in the paranasal sinuses, the locations

and sizes of all cysts were evaluated. The medical records and endoscopic nasal examinations of patients with MRCs were retrospectively reviewed. Endoscopic nasal examinations were performed using a rigid 4-mm Storz nasal endoscope with 0° and 30° angled lenses (Xion Medical GmbH, Berlin, Germany) following the topical application of 4% lidocaine with 1:100 000 adrenaline to the nasal cavity. Symptomatic retention cysts have been treated by puncture and aspiration through the meatus of the sinus or natural ostium, or removed using the Caldwell–Luc approach. Patients were advised that their cysts were benign and did not require long-term follow-up after surgery.

Results:

A total of 91 MRCs were found in 80/510 patients whose CT images were reviewed. The overall incidence of cysts was 15.6% (Table 1). Distribution of the cysts according to sinuses was illustrated at Tables 2 and 3. Of the 80 patients, 17 (18.5%) had bilateral cysts in the maxillary sinuses. Some patients had cysts in more than one sinus. Two (2.5%) patients had bilateral maxillary and left frontal sinus MRCs.

MRC size, measured on coronal CT images of the paranasal sinuses, ranged from 103 to 685 mm² (mean, 212 mm²) in the maxillary sinus, and the cyst: antral size ratio ranged from 12.8% to 76.9% (mean, 27.3%). In the frontal sinus, MRC size ranged from 160 to 852 mm² (mean, 367 mm²) and the cyst: antral size ratio was 15.3–46.9% (mean, 21.4%). The size of ethmoid sinus cysts ranged from 26 to 40 mm² (mean, 28 mm²), and the cyst: antral size ratio ranged from 41.8% to 83.2% (mean, 68.8%). The sphenoid sinus cyst size ranged from 86 to 285 mm² (mean, 142 mm²), and the cyst: antral size ratio ranged from 21.8% to 53.2% (mean, 37.4%).

More males than females were included in our study,

Presence of cysts	Males	Females	Total
Yes	62.5% (50/80)	37.5% (30/80)	15.6% (80/510)
No	59.8% (257/430)	40.2% (173/430)	84.3% (430/510)

Table 1: Distribution of cysts in males, females, and the total sample (n = 510).

	Bilateral	Right	Left	Total
Maxillary	18.5% (17/92)	31.5% (29/92)	32.6% (30/92)	82.6% (76/92)
Sphenoid	-	1.1% (1/92)	2.2% (2/92)	3.3% (3/92)
Frontal	-	2.6% (2/92)	6.5% (6/92)	8.7% (8/92)
Ethmoid	-	2.2% (2/92)	3.2% (3/92)	5.4% (5/92)
TOTAL	18.5% (17/92)	37.4% (34/92)	44.5% (41/92)	

Table 2: Distribution of cysts in the paranasal sinuses.

	Right frontal	Left frontal	Right ethmoid	Left ethmoid	Right sphenoid	Left sphenoid
Bilateral maxillary sinuses	-	2	-	2	-	-
Right maxillary sinus	1	-	1	-	-	-
Left maxillary sinus	-	3	-	1	-	2

Table 3. Distribution of cysts in the maxillary sinuses and other sinuses.

but this difference was not statistically significant ($P > 0.05$). Furthermore, the study population was comprised of significantly more patients aged 20–40 years than other age groups ($P < 0.011$). Eight patients underwent surgery to treat obstruction of the maxillary sinus ostium ($n = 3$), hemifacial pain and tenderness referring to the posterior teeth ($n = 1$), right frontoethmoidal mucocele impressing upon the orbit ($n = 1$), and dental symptoms resulting from a maxillary sinus MRC ($n = 3$). Caldwell Luc approach was performed on all of those patients. Other cysts were asymptomatic and required no further treatment because the lesions tend to spontaneously shrink or do not change and presented no major problem.

Discussion:

The incidence of retention cysts in the paranasal sinuses is 1.4–9.6% in the general population^{10-16,18}. Allard et al¹ reported that the incidence of mucosal sinus cysts was 8.7% in their study of 1,080 patients. The incidence of MRCs in the maxillary sinus has been reported to be between 3.19% and 26%¹⁸⁻²² (Table 4), and we found that the incidence of MRCs was 14.9% in the maxillary sinus and 15.6% in all paranasal sinuses.

CT is the gold standard for radiographic evaluation of the paranasal sinuses; it enables assessment of patency among the intercommunicating channels of the sinuses and allows clinicians to visualise the impact of inflammatory disease and anatomical variations on channel patency²³. For this reason, we used CT to examine the paranasal sinuses. The same certified radiologist reviewed all sagittal and coronal images.

Previous studies have reported predominantly left (60.9% vs. 39.1%)¹² and right (55% vs. 45%)²⁴ distributions of retention cysts. We observed more left than right paranasal sinus cysts (44.5% vs. 37.4%, respectively). We found that cysts were located most frequently in the maxillary sinuses, followed by the frontal, ethmoid, and sphenoid sinuses. Our study is the first to investigate the incidence of MRCs in all paranasal sinuses.

Although commonly known as ‘mucous retention

cysts’, MRCs may be classified into two types: mucous and serous^{3,5}. MRCs occur frequently and are caused by the obstruction of a seromucinous gland. Serous retention cysts are the result of fluid accumulation in the submucosal layer. Both types of retention cyst appear as smooth, outwardly convex soft-tissue masses on images. We regarded all retention cysts as MRCs.

Retention cysts have been reported to show a male: female ratio of 2:1^{11,13}, which is supported by our finding of a male:female ratio of 1.7:1. The incidence of MRCs has been reported to be highest among patients aged 30–40 years^{8,24-26}. Our results were similar to those of Rodrigues et al⁸, showing a prevalence of MRCs in patients aged 20–40 years and a decreased incidence in older adults.

Long-term follow-up studies generally have revealed no significant change in MRC size; a few cysts gradually increase in size, but the majority resolve spontaneously^{15,23-25}. The rate of spontaneous regression and disappearance of maxillary sinus MRCs is 17.6-38%²⁴⁻²⁶. Moreover, 6-23% of maxillary sinus cysts rupture spontaneously^{27,28}. Although some MRCs require management, not every instance of mucous retention must be referred to an ear, nose, and throat specialist.

The majority of MRCs are asymptomatic. Cysts that put pressure on the mucosal lining of sinuses cause symptoms such as headache and periorbital or facial pain, and those that obstruct the ostium may cause paranasal sinus infection, nasal obstruction, postnasal drip, and nasal discharge, which may require treatment^{11,29}. Symptomatic cysts are typically treated by puncture and aspiration through the inferior meatus³⁰. Other treatment options include excision through an intranasal antrostomy, the Caldwell-Luc procedure, and intranasal endoscopic sinus surgery, which has gained popularity recently^{29,31-33}. Eight patients in our study required surgery.

Our results indicate that the incidence of MRCs in all paranasal sinuses is 15.6% in patients with sinonasal disorders. We found no difference in the

Report	Mean age / Years	F:M	Mean cyst size	Radiologic modality	Maxillary RC incidence	Ethmoid RC incidence
Rodrigues [8]	25	0:7	-	Panoramic graphy	201/6293 (3.19%)	-
Wang et al. [15]	56.9	0:6	-	CT	4/67 (9.3%)	2/67 (8.7%)
Bosio et al. [18]	-	1:2	-	Panoramic graphy	10/173 (5.9%)	-
Bhattacharyya et al [19]	41.3	2:2	156 mm ²	CT	51/410 (12.4%)	-
Berenholze et al. [20]	26	0:6	-		12/113 (11%)	-
Tarp et al. [21]	44	1:4	-	MRI	60/404(14.9%)	-
Coleman et al. [22]	32	2:4	-	CT	31/119 (26%)	-
Garca et al. [33]	39	0:8	-	CT	8/100 (8%)	-
Present study	37.9	0:7	212 mm ²	CT	76/510 (14.9%)	5/510 (1%)

Table 4. Previous reports of retention cyst incidence rates.

left/right side distribution of the cysts; however, our population included significantly more males than females, and significantly more patients aged 20-40

years than other age groups. We performed Caldwell Luc approach to treat symptomatic retention cysts, including complicated mucoceles.

References:

1. Allard RHB, van der Kwast WAM, van der Waal I (1981) Mucosal antral cysts. Review of the literature and report of a radiographic survey. *Oral Surg Oral Med Oral Pathol* 51: 2-9.
2. Gnepp DR (2001) *Diagnostic Surgical Pathology of the Head and Neck*. Philadelphia PA: WB Saunders Company pp: 80-91.
3. Neville BW, Damm DD, Allen CM, Bouquot JE (1995) *Oral and Maxillofacial Pathology*. Philadelphia: WB Saunders Company pp: 231-232.
4. Gardner DG (1984) Pseudocysts and retention cysts of the maxillary sinus. *Oral Surg Oral Med Oral Pathol* 58: 561-567.
5. Eggesbo HB (2006) Radiological imaging of inflammatory lesions in the nasal cavity and paranasal sinuses. *Eur Radiol* 16: 872-888.
6. Koki S, Kiyoshi Y, Yutaka S, Tooru (2005) Three cases of sphenoid sinus retention cyst of the headache-including a discussion of surgical approaches to the sphenoid sinus. *Otolaryngol Head Neck Surg (Tokyo)* 48: 174-181.
7. Ichimura K, Ohta Y, Maeda YI, Sugimura H (2001) Mucocoeles of the paranasal sinuses with intracranial extension-postoperative course. *Am J Rhinol* 15: 243-247.
8. Rodrigues CD, Freire GF, Silva LB, Fonseca da Silveira MM, Estrela C (2009) Prevalence and risk factors of mucous retention cysts in a Brazilian population. *Dentomaxillofac Radiol* 38: 480-3.
9. Habesoglu TE, Habesoglu M, Surmeli M, Uresin T, Egeli E (2010) Unilateral sinonasal symptoms. *J Craniofac Surg* 21: 2019-2022.
10. Cooke LD, Hadley DM (1991) MRI of the paranasal sinuses: incidental abnormalities and their relationship to symptoms. *J Laryngol Otol* 105: 278-281.
11. Ruprecht A, Batniji S, El-Neweihi E (1986) Mucous retention cyst of the maxillary sinus. *Oral Surg Oral Med Oral Pathol* 62: 728-731.
12. Halstead CL (1973) Mucosal cysts of the maxillary sinus: report of 75 cases. *J Am Dent Assoc* 87: 1435-1441.
13. Myall RW, Eastep PB, Silver JG (1974) Mucous retention cysts of the maxillary antrum. *J Am Dent Assoc* 89: 1338-1342.
14. Rhodus NL (1990) The prevalence and clinical significance of maxillary sinus mucous retention cysts in a general clinic population. *Ear Nose Throat J* 69: 82-87.
15. Wang JH, Jang YJ, Lee BJ (2007) Natural course of retention cysts of the maxillary sinus: long-term follow-up results. *Laryngoscope* 117: 341-344.
16. Sievers KW, Greess H, Baum U, Dobritz M, Lenz M (2000) Paranasal sinuses and nasopharynx CT and MRI *Eur J Radiol* 33: 185-202.
17. Anon JB (1997) Report of the rhinosinusitis task force committee meeting. *Otolaryngol. Head Neck Surg Suppl* 117: S1-68.
18. Bósio JA, Tanaka O, Rovigatti E, Gruner SK (2009) The incidence of maxillary sinus retention cysts in orthodontic patients. *World J Orthod* 10: e7-e8.
19. Bhattacharyya N (2000) Do maxillary sinus retention cysts reflect obstructive sinus phenomena? *Arch Otolaryngol Head Neck Surg* 126: 1369-1371.
20. Berenholze L, Kessler A, Lapinsky J, Segal S, Shlamkovitch N (2000) Nasal obstruction in the adult: is CT scan of the sinuses necessary? *Rhinology* 38: 181-184.
21. Tarp B, Fiirgaard B, Christensen T, Jensen JJ, Black FT (2000) The prevalence and significance of incidental paranasal sinus abnormalities on MRI. *Rhinology* 38: 33-38.
22. Coleman H, Meer S, Altini M, Reyneke J, Becker P (2005) Maxillary sinus pathology in 119 patients—a histopathologic study *SADJ* 60: 140,142-145.
23. Schuknecht HF, Lindsay JR (1949) Benign cysts of the paranasal sinuses. *Arch Otolaryngol* 49: 609-30.
24. Casamassimo PS, Lilly GE (1980) Mucosal cysts of the maxillary sinus: a clinical and radiographic study. *Oral Surg Oral Med Oral Pathol* 50: 282-286.
25. Gothberg KAT, Little JW, King DR, Bean RL (1976) A clinical study of cysts arising from mucosa of the maxillary sinus. *Oral Surg Oral Med Oral Pathol* 41: 52-58.
26. Lilly GE, Cutcher JL, Steiner M (1968) Spherical shadows within the maxillary antrum. *J Oral Med* 23: 19-21.
27. Hoang JK, Smith EC, Barboriak DP (2009) Ruptured maxillary retention cyst: cause of unilateral rhinorrhea after trauma. *AJNR Am J Neuroradiol* 30: 1121-1122.
28. Ruprecht A, Lau W (1990) Rupture of a mucous

- retention cyst. Oral Surg Oral Med Oral Pathol 70: 683.
29. Hadar T, Shvero J, Nageris BI, Yaniv E (2000) Mucus retention cyst of the maxillary sinus: the endoscopic approach. Br J Oral Maxillofac Surg 38: 227-229.
30. Rahnama M, Czupkałto Ł, Czajkowski L, Czajkowska W, Kozicka-Czupkałto M (2012) Mucous retention cyst of the maxillary sinus - minimally invasive treatment with use of piezosurgery. Case report. Pharm Med Sci 25: 349-352.
31. Kwapis BW, Whitten JB (1971) Mucosal cysts of the maxillary sinus. J Oral Surg 29: 561.
32. Ence BK, Parsons DS (1990) Mucous retention cyst causing pain of the infraorbital nerve. Otolaryngol Head Neck Surg 103: 1031-1034.
33. Garça MF, Çelik Ö, Gültekin E, Külekçi M (2010) Fonksiyonel endoskopik sinus cerrahisi sonuçlarımız. Tıp Araştırmaları Dergisi 8: 89-93.