

Research Article

Cone-beam Computed Tomography Evaluation of the Incidental Findings on Maxillary Sinus Mucosa

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ABSTRACT

Purpose: A mucous retention cyst is a benign pseudocyst whose presence in the maxillary sinus is asymptomatic. The aim of this study was to evaluate the incidental findings on maxillary sinus mucosa using cone-beam computed tomography and some related factors.

Materials and Methods: This cross-sectional study was conducted on 200 cone-beam computed tomography scans from patients referring to the radiology clinic of Oral and Maxillofacial Department in Babol City over a year. The frequency of mucosal thickness, mucous retention cyst prevalence, its place in different walls of the maxillary sinus and some associated factors including sex, age and season were evaluated.

Results: Among 200 studied cases, 108 (54%) patients had mucosal thickening, which was more common in men (68.6%) and in the age ranged from 48 to 57 years (62%) ($P < 0.05$). Mucous retention cyst prevalence was 14.5% from which 62.1% of cases were found in the sinus floor.

Conclusion: Given the high prevalence of increased thickness of mucus in maxillary sinus, the preliminary examination of maxillary sinuses is recommended before surgery.

Key words: Mucosal retention cyst, Maxillary sinus, Sinus radiography, Cone-beam computed tomography

INTRODUCTION

A mucous retention cyst of maxillary sinus is a benign pseudocyst, which is mainly clinically asymptomatic and incidentally found in sinus radiography. In a radiograph, pseudocysts usually appear as a smooth periphery with radiopaque masses with defined and without cortical margins^[1] (Figures 1, 2).

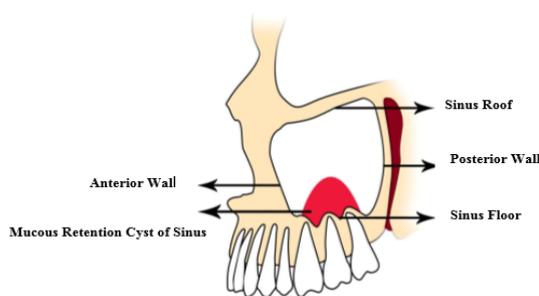


Fig 1. Schematic imagine of mucosal benign cyst in the sagittal plane

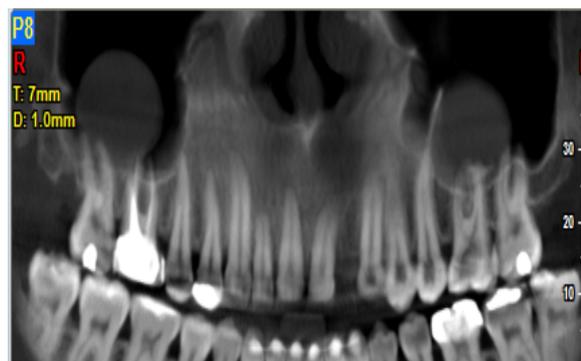


Fig 2. Panoramic imagine of mucosal benign cyst in maxillary sinus

Their size is ranged from less than one centimeter to cover the entire sinuses and sometimes they are seen bilateral^[1, 2]. When this cyst surrounds the sinus completely, it can lead to fullness in the sinuses, nasal obstruction and

postnasal discharge, and it needs medical treatment in the case of clinical symptoms^[2,3].

Various studies and evaluating the randomized findings in the cone-beam computed tomography (CBCT) images have shown that the prevalence of these findings vary between 23 to 44%. The prevalence of retention cyst was 10% and of thickening was from 29 to 68%^[4,5]. Knowledge of the clinical and radiographic characteristics of this lesion results in the proper diagnosis and treatment of sinus lesions and reducing the complications^[1].

Appropriate imaging has an essential role in this field^[6]. CBCT technique was introduced in 1998 and now, it is a popular technique in dental diagnosis and treatment.

Unlike other extra-oral radiography, CBCT technique provides 3D images with high details and accuracy and it has less dose and cost than CT technique^[7]. Therefore, the aim of the current study was to evaluate the incidental findings of maxillary sinus mucosa in the CBCT images, the frequency of increased thickness of mucus, mucosal benign cysts, its location, its prevalence and the effect of factors such as gender, age and affected season.

MATERIALS AND METHODS

This cross-sectional study was conducted on 200 CBCT scans from patients referring to the radiology clinic of Oral and Maxillofacial Department in Babol City from 2014 to 2015. Inclusion criteria were as following:

- 1) Patients older than 18 years.
- 2) Patients with maxillary CBCT in which the upper jaw and sinuses were seen bilaterally.
- 3) Patients without facial Cranio- syndromes.
- 4) Patients without acute trauma in the upper jaw.

A checklist was prepared to record the demographic data and information related to the studied subject (thickness of sinus mucosal and characteristics of benign mucosal cyst).

All CBCT images were prepared by using CBCT NewtomGiano made in Italy. The images without technical errors were included in the present study.

The images were exhibited in completely dark place on the screen 19-inch (Samsung Sync

Master SN 1943) with high resolution and without time limit and two oral and maxillofacial radiologists were simultaneously evaluated the images based on the proposed variables in the checklist and a unified opinion was recorded.

NNT software was used to analyze the images in 3-D sagittal, panoramic and cross-sectional views (Figure 3).

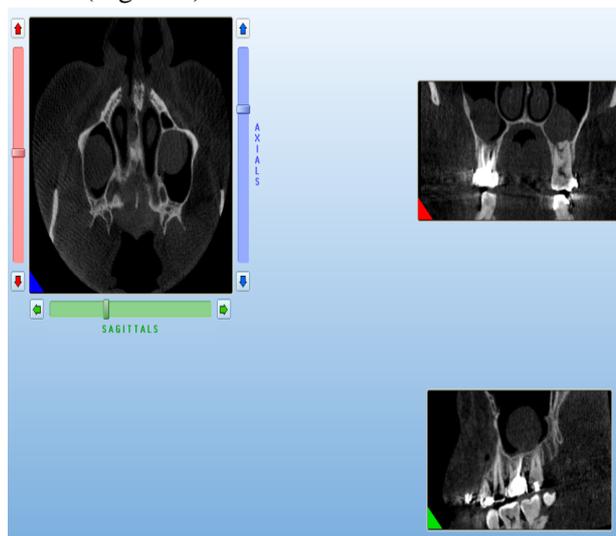


Fig 3. Mucosal benign cyst of maxillary sinus (right sinus) in a. axial b. coronal c. saggital

The criterion of diagnosis of benign mucosal cyst is opaque masses with distinctive dome and non-cortical margins based on its radiographic view.

Evaluation of increased mucosal thickness was conducted in cross-sectional view. This thickness was measured using NNT software in the area of the sinus which had the maximum thickness and was perpendicular to the bone surrounding area.

Thickness more than 1 mm was considered as feature of mucosal thickening. Cross-sectional and panoramic views were used to evaluate the cyst. Radiographic criteria for diagnosing the cyst included the following:

- 1) The presence of a dome-shaped opacity in the maxillary sinus with clear lateral walls.
- 2) The absence of bone erosion
- 3) The lack of attachment to root of the teeth
- 4) The presence of defined margins on the free lateral walls of cyst

The measurement of cysts was performed from the floor of sinus to the highest edge of cyst

based on millimeters. Cysts were classified based on the largest diameter into small less than 10 mm, average between 10 to 20 mm and greater than 20 mm.

All lesions were divided into the following items based on the location:

- ❖ Unilateral or bilateral
- ❖ Left or right (in the lateral case)
- ❖ Involved walls.

The data were entered into SPSS 22. Continuous and discrete data were reported as mean (\pm SD) and frequency (number and percent). Independent t-test was used for comparison of continuous data and chi-square tests was used to compare the discrete data. $P < 0.05$ was considered significant.

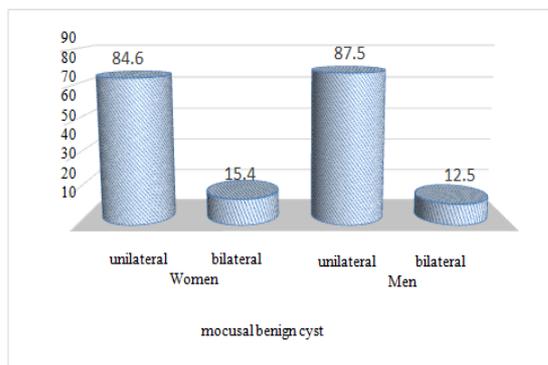
RESULTS

In this study, 200 patients were 86 (43%) men and 114 (57%) women. Patients aged from 18 to 74 with the mean of 41.81 years.

Mucosal thickening was observed in 108 (54%) CBCT scans, which was significantly more common in men (68.6%) than women (43%) ($P < 0.05$).

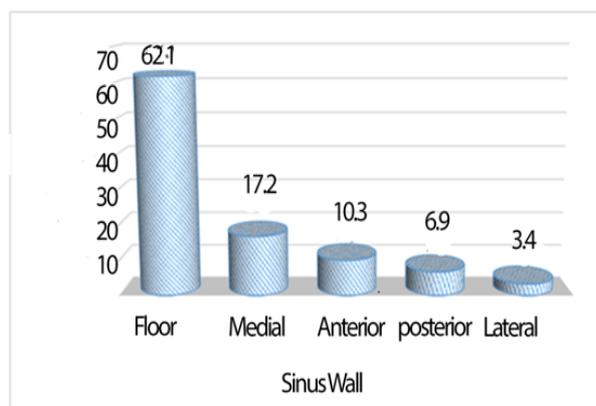
From 200 patients, 29 (5/14%) had benign mucosal cyst that 86.2% and 13.8% were lateral and bilateral, respectively (Table 1). Only 14% of women and 15.1% of men had cyst so there was no significant difference between gender and incidence of cyst.

Table 1. Position of mucosal benign cysts in maxillary sinus in men and women



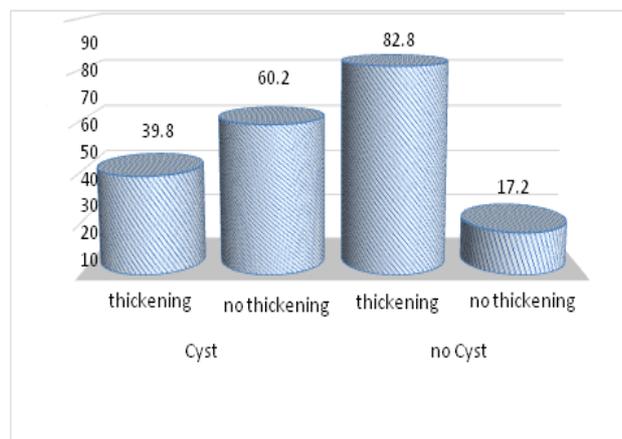
Totally, 62.1%, 17.2%, 10.3%, 6.9% and 3.4% had cyst in the sinus floor, medial wall, anterior wall, posterior wall and lateral wall of sinus, respectively (Table 2). No significant relationship was found between age and incidence of retention cyst.

Table 2. Positions of cysts in different walls of maxillary sinus in patients with cysts



The mucosal thickening was observed in 39.8% of patients with cysts. There was a significant relationship between these two findings ($P < 0.05$) based on the results of chi-square test (Table 3).

Table 3. Relationship between mucosal benign cyst and thickening of sinus wall



The prevalence of cyst among 29 patients was 44.8%, 34.5%, 17.2% and 3.4% in autumn, winter, summer and spring, respectively. In fact, statistically, there was a significant difference between the cold and warm seasons in terms of the frequency of benign mucosal cyst ($P < 0.05$).

DISCUSSION

The prevalence of mucous retention cyst was 14.5% in the current study. Lana et al^[1] in Brazil reported the prevalence of this lesion was 21.4% in CBCT scans. This finding was 10% in the studies of Som, Carrie, Phothikhun and Rage^[11,10,9,4].

The prevalence of the cyst was 7% in panoramic images in Abesi et al.'s study^[12] conducted in Babol Dental School. The prevalence of this

lesion was 5.1% , 20.5%, 4%, 14% and 2% in the studies of Imani Moghaddam^[13] in Mashhad, Mehdi Zadeh et al. ^[14] in Isfahan, Ne'mati et al. ^[15], Ghaffari et al. ^[16] in Rasht and Wood ^[17] , respectively.

Difference in obtained results could be due to the difference in sample size, different geographical areas and type of imaging technique.

The frequency of reported retention cyst was different between the present study and the study of Abesi et al. ^[12] in Babol, which indicated that CBCT is superior to panoramic one. In panoramic view, only the floor, anterior and posterior walls of maxillary sinus can be seen as superimposition on a single image, while all walls of the sinus in different planes (sagittal, coronal and axial) are observed at regular intervals and successive in CBCT images. Therefore, the presence of benign mucosal cysts can be determined easily with high accuracy.

The prevalence of retention cyst was 14% and 15.1% in men and women, respectively. No significant difference was found between the gender of the patients and the incidence of cysts, which is consistent with the studies of Imani Moqaddam, Rupercht, Wood, Bohay, Mehdi Zadeh and Ragav^[13,21,17,14,18].

The prevalence of cyst was higher in men than women in many studies ^[12,22,20,15,19,9]. In this study, the frequency of unilateral retention cyst (86.2%) was more than that of bilateral one (13.8%), which is similar to the findings of Wang ^[23], Casamassimo^[24] and Imani Moghaddam^[13].

However, in the study of Absi^[12] and Duple^[25], the frequency of bilateral retention cyst was more than that of unilateral one. Among 29 benign mucosal cyst, the most cases (62.1%) were recognized in the floor of the maxillary sinus, which is consistent with the findings of Absy, Lana, Vjyatzy, Imani Moghaddam and Ghaffari^[12,8,20,13,16].

According to this result, the incidence of retention pseudocyst was more common in sinus floor than the other walls. In the present study, the most and least frequency of cyst was related to the age range of 58-67 (23.5%) and 48-57 years (10%), respectively. There was no

significant relationship between retention cyst and age, which is the same as the findings of Vallo, Mehdi Zadeh, Raje, Ne'mati, Imani Moghaddam and Ragav^[22,14,4,15,13,18].

In the current study, the increase of mucosal thickness with 54% frequency was the most common incidental finding in the maxillary sinus. The prevalence of this finding was reported between 29 to 68% in other studies ^[8,4,25,18,14,9] that are consistent with the current study. The difference in the frequency may be due to the differences in race, technique and imaging accuracy.

According to the present findings, the frequency of sinus mucosal thickening was more in men (68.6%) than women (43%) and showed a significant relationship with the gender of the patients, which is consistent with the studies of Vallo, Phothikhun and Vogiatzi^[20,22,9].

In Mehdi Zadeh, Duple and Ragav studies^[18,25,14], these findings were more common in men, but there was no significant difference between men and women. No significant difference was observed in terms of the frequency of mucosal thickening in different ages which agrees with the studies of Mehdi Zadeh, Raghav and Vallo^[14,18,22]. Nevertheless, mucosal findings were significantly more common in those aged over 60 years in the study of Ritter^[26].

In this study, sinus mucosal thickening was observed in 39.8% of patients with retention cyst. There was a significant relationship between retention cyst and thickening of the sinus wall based on the results of chi-square test ($P < 0/05$).

In the present study, there was a significant relationship between the incidence of sinus retention cyst and cold seasons, which is compatible with the findings of Imani Moghaddam^[13]. In Abesi's study ^[12], the highest frequency was in October, May and June, which indicated the seasonal allergies in the incidence of this cyst. However, in the studies of Rodriguez ^[27] and Pazera^[7], imaging season had no effect on the incidence of incidental findings of sinus. Climate changes and different seasons in various geographical areas are the cause of this difference.

In this study, considering that the mucosal thickening of the maxillary sinus was found in more than half of the cases therefore it is recommended that the surgeons perform accurate study before their surgery using CBCT to avoid complications and possible problems associated with surgery in this area.

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REFERENCES

1. BohayRN, Gordon SC. The maxillary mucous retention cyst, a common incidental panoramic finding. *oral health* 1997;87(7):7-10
2. White SC, Pharoah MJ. Oral radiology. Principles and interpretation. 7th ed. St Louis: Mosby Co 2013; pp:506-12.
3. HadarT ,shvero J . NagerisBI ,Yaniv E. Mucus retention cyst of the maxillary sinus:the endoscopic approach .*BR J oral maxillofac surg* 2000;38(3):227-9.
4. Rege IC, Sousa TO, Leles CR, Mendonca EF. Occurrence of maxillary sinus abnormalities detected by cone beam CT in asymptomatic patients. *BMC Oral Health* 2012;12(30):30.
5. Price JB, Thaw KL, Tyndall DA, Ludlow JB, Padilla RJ. Incidental findings from cone beam computed tomography of the maxillofacial region: a descriptive retrospective study. *Clin Oral Implants Res* 2012; 23(11):1261-8.
6. Mafee MF, Tran BH, Chapa AR. Imaging of rhinosinusitis and its complications: plain film, CT, and MRI. *Clin Rev Allergy Immunol* 2006;30(3):165-86.
7. Pazera P, Bornstein MM, Pazera A, Sendi P, Katsaros C. Incidental maxillary sinus findings in orthodontic patients: a radiographic analysis using cone-beam computed tomography (CBCT). *OrthodCraniofac Res* 2011; 14(1):17-24.
8. Lana JP, Carneiro PM, Machado Vde C, de Souza PE, Manzi FR, Horta MC. Anatomic variations and lesions of the maxillary sinus detected in cone beam computed tomography for dental implants. *Clin Oral Implants Res* 2012; 23(12):1398-403.
9. Pothikhun S, Suphanantachat S, Chuenchompoonut V, Nisapakultorn K. Cone-beam computed tomographic evidence of the association between periodontal bone loss and mucosal thickening of the maxillary sinus. *J Periodontol* 2012;83(5):557-64.
10. Carrie A, Bobb R. Mucoceles of the paranasal sinuses. 2000; [3 screens] Availabel at: URL: <http://www.bcm.edu/oto/grand/05252000>. Accessed April 26, 2008.
11. Som PM, Curtin HD. Head and Neck Imaging. 4th ed. St. Louis: Mosby Co; 2003. P. 200-5, 214-5.
12. Abesi F, Mirshekar A, Babae N, Heidari H, Mohammadzadeh I. Prevalence of mucous retention cysts of maxillary sinus in panoramic radiography. *J Babol Univ Med Sci* 2013;15(3):103-7.
13. ImaniMoghaddam M, Bagherpour A, AhmadianYazdi A, Qmarci N. Prevalence and Some Associated Risk Factors of Maxillary Sinus Mucous Retention Cyst in Panoramic View of Patients Referred to Radiology Department of Mashhad Dental School-Iran 2007. *J Mash Dent Sch* 2009; 33(2): 89-96.
14. Mehdizadeh M, Torabinia A, Kasaei S, Farhad F. Evaluation of the prevalence of accidental findings in maxillary sinus in the CBCT archives of Isfahan Faculty of Dentistry. *J Isfahan Dent Sch* 2015; 11(3):223-229.
15. Nemati S, Mohtavipour T, Vadiati Saberi B, Mirkhani MH, PourHabibi Z. Frequency of the Maxillary Sinus Mucous Retention Cyst in Digital Panoramic Radiographs of the Patients attending to the Dental Faculty of Rasht during 2012-2013. *Journal of Mashhad Dental School*, 2014(Issue 4). Pages 363-374.
16. Ghafari R, Dalili Z. Frequency of retention cyst of maxillary sinus in panoramic radiography. *Guilan University of Medical Sciences Journal* 2006; 15(60): 83-79. (Persian).

17. Wood NK, Goaz PW. Differential Diagnosis of Oral and Maxillofacial Lesions. 5th ed. St. Louis: Mosby Co; 1997. P. 470.
18. Raghav M1, Karjodkar FR1, Sontakke S1, Sansare K1. Prevalence of incidental maxillary sinus pathologies in dental patients on cone-beam computed tomographic images. *Contemp Clin Dent*. 2014 Jul;5(3):361-5. Doi: 10.4103/0976-237X.137949.
19. Allar RHB, Van der Kwast W, Van der Waal. Mucosal antral cysts. Review of the literature and report of a radiographic survey. *Oral Surg Oral Med Oral Pathol* 1981; 51: 2-9.
20. Vogiatzi T, Kloukos D, Scarfe WC, Bornstein MM. Incidence of anatomical variations and disease of the maxillary sinuses as identified by cone beam computed tomography: a systematic review. *Int J Oral Maxillofac Implants*. 2014 Nov-Dec;29(6):1301-14.
21. Ruprecht A, Batniji S, el-Neweihi E. Mucous retention cyst of the maxillary sinus. *Oral Surg Oral Med Oral Pathol* 1986; 62(6): 728-31.
22. Vallo J, Suominen-Taipale L, Huuonen S, Soikkonen K, Norblad A. Prevalence of mucosal abnormalities of the maxillary sinus and their relationship to dental disease in panoramic radiography: results from the Health 2000 Health Examination Survey. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2010; 109(3):e80-7.
23. Wang JH, Jang YJ, Lee BJ. Natural course of retention cysts of the maxillary sinus: Long-term follow-up results. *Laryngoscope* 2007; 117(2): 341-4.
24. Casamassimo PS, Lilly GE. Mucosal cysts of the maxillary sinus: A clinical and radiographic study. *Oral Surg Oral Med Oral Pathol* 1980; 50(3): 282-6.
25. Dobelev I, Kise L, Apse P, Kragis G, Bigestans A. Radiographic assessment of findings in the maxillary sinus using cone-beam computed tomography. *Stomatologija*. 2013;15(4):119-22.
26. Ritter L, Lutz J, Neugebauer J, Scheer M, Dreiseidler T, Zinser MJ, et al. Prevalence of pathologic findings in the maxillary sinus in cone-beam computerized tomography. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2011;111:634-40.
27. Rodrigues CD, Freire GF, Silva LB, Fonseca da Silveira MM, Estrela C. Prevalence and risk factors of mucous retention cysts in a Brazilian population. *Dentomaxillofac Radiol*. 2009;38:480-3.