

Clinical Characteristics of Postoperative Maxillary Cyst

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Purpose: The purpose of this study is to analyze the clinical features of postoperative maxillary cyst (POMC) according to the patient's medical history of previous sinus operation and symptoms with radiological characteristics.

Materials and Methods: The subjects of this study were 41 patients who had been diagnosed with POMC via clinical and histological examination from 2007 to 2016.

Result: Thirty-five patients had medical histories of Caldwell-Luc procedures and four patients had maxillary sinus surgery, such as cyst enucleation and open reduction for maxillary bony fractures. From the computed tomography images, 25.6% (11/43) showed multilocular cysts and 74.4% (32/43) showed unilocular lesions. As for the treatment methods, cyst enucleation was conducted on 34 patients, and among them, three were treated previously with marsupialization. Their symptoms included diverse locations of pain and swelling.

Conclusion: The clinical features of POMC varied from unilocular to multilocular and the symptoms included pain and swelling.

Key Words: Cyst; Maxillary sinus; Sinusitis

Introduction

Postoperative maxillary cysts (POMCs) are well-known for their unique pathological etiology related to surgical intervention of maxilla involving the sinus membrane area, and was first reported by Kubo¹⁾ in Japan in

1927. Although Gregory and Shafer²⁾ thought that they were describing a novel condition, their report of surgical ciliated cysts complicating operations on the maxillary sinus in North American patients in 1958 undoubtedly describes the same lesion. POMC is also known as postoperative paranasal cyst³⁾, postoperative

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mucoceles of the maxillary sinus^{4,5}, and respiratory implantation cyst^{6,7}. The POMC, or surgical ciliated cyst, is a locally aggressive benign lesion, usually developing as a delayed complication many years after radical surgery on the maxillary sinus area, especially Caldwell-Luc procedure. Clinically, the patient's chief complaints include swelling, pain, dysesthesia or fistula in the maxillary area. Histologically, these cysts are usually lined by the respiratory type pseudo-stratified columnar ciliated epithelium, but squamous cuboidal epithelium and metaplasia could also be observed. Therefore, it may be difficult to distinguish the lesion by histologic findings alone in many cases. In terms of diagnosis, the patient's history of maxillary surgery is very important. Radiologically it appears as a radiolucent, well-defined unilocular or multilocular cyst. Bony expansion and/or perforation are frequently observed.

The purpose of this study is to analyze the clinical features of POMC in the patient's medical history of

previous sinus surgery and symptoms with radiological characteristics.

Materials and Methods

The subjects of this study consisted of 41 patients who had visited the Department of Oral and Maxillofacial Surgery, School of Dentistry, Kyungpook National University from 2007 to 2016. Forty-four specimens were obtained from 41 patients (including three with bilateral lesions). All patients were initially diagnosed with POMC by clinical and histological findings. For the radiological examination, both panoramic and Waters' radiograph were applied in all cases. Additional computed tomography (CT) images were taken in 39 patients. Enucleation or marsupialization procedures were performed on 40 patients, and one patient was treated by sinus irrigation. During the surgical intervention, either incisional or excisional biopsy was done simultaneously. Following the biopsy, all cases were ultimately diagnosed as POMC pathologically.

Table 1. Gender and age distribution at diagnosis of post-operative maxillary cyst

Age (yr)	Male (n)	Female (n)	Total patient (n)
30~39	1	3	4
40~49	6	3	9
50~59	8	6	14
60~69	2	5	7
70~79	3	3	6
80~89	1	0	1
Total patient	21	20	41

Table 2. Interval between causal events and diagnosis of POMC

Interval between causal events and the time of diagnosis of POMC (yr)	Patient (n)
0~9	3
10~19	8
20~29	9
30~39	11
40~49	4
50~59	5
60~69	1

POMC: postoperative maxillary cyst.

Result

Gender and age distributions are shown in Table 1. Of the 41 patients, 21 were male and 20 were female. Hence, no gender predilection was observed. Mean age was 55 years and the lesion occurred over a wide age distribution, most frequently in the fifth decade of life with a range of 31 to 82 years (Table 2). Thirty-five patients had past medical histories of Caldwell-Luc procedure and two had maxillary sinus surgery for cyst-enucleation and open reduction of maxillary bony fractures (Table 3). The most frequently seen interval

Table 3. Causal event of POMC

Causal event	Patient (n)
Caldwell-Luc procedure	35
Cyst-enucleation	2
Bony trauma of maxilla	2
Could not remember	2

POMC: postoperative maxillary cyst.

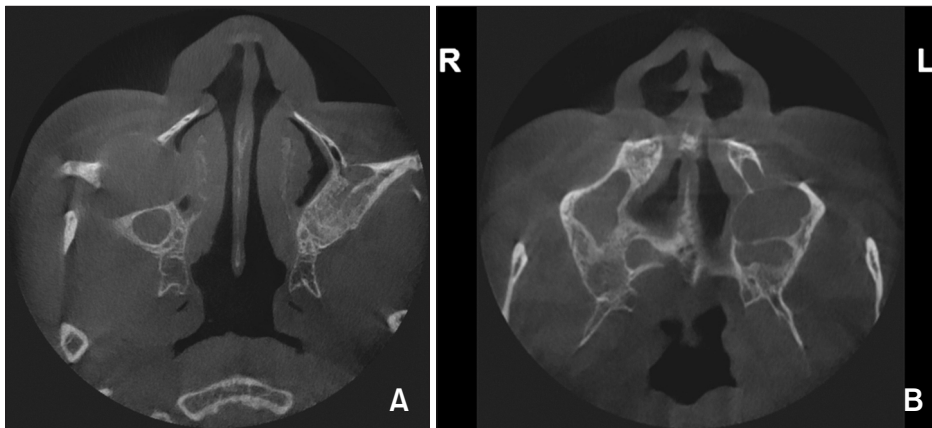


Fig. 1. (A) Unilocular postoperative maxillary cyst (POMC) on right maxillary sinus. The patient had a medical history of both maxillary Caldwell-Luc operation and (B) multilocular POMC on left maxilla. The bony window for the Caldwell-Luc approach is seen on left maxillary anterior wall.

Table 4. Clinical manifestations of POMC patients

Clinical manifestation	Patient (n)
Pain	28
Swelling	31
Pus	3
Paresthesia	6
Fistula	4

POMC: postoperative maxillary cyst.

Table 5. Adopted treatment method for POMC patients^a

Treatment method	Patient (n)
Enucleation	34
Marsupialization	5
Enucleation after marsupialization	3
Sinus irrigation	1

POMC: postoperative maxillary cyst.

^aIn three patients, marsupialization was adopted but failed to heal completely and enucleation was subsequently performed.

between causal events and the time of diagnosis of POMC was between 30 and 39 years, and for 78.0% of patients, the interval ranged from 10 to 49 years (two patients were unable to recall the causal event of POMC, but were histologically diagnosed as having POMC). Twenty-two lesions were detected on the left maxillary sinus, sixteen on the right, and three lesions were bilateral. The main radiological finding was a unilocular radiolucency with bony expansions. But, 11 lesions were multilocular, and bony perforations were also found on 19 lesions. As a diagnostic modality, computerized tomography was more efficient than standard radiographs (panoramic view and Waters' view). For preoperative diagnosis evaluated by an oral and maxillofacial radiologist, CT accurately identified the lesion 57.5% (23/40) of the time while standard radiographs identified lesions 26.8% (11/41) of the time. On CT image, 25.6% (11/43) of lesions were multilocular cystic in appearance and 74.4% (32/43) was unilocular (Fig. 1). Sinus wall expansions were observed in 31 lesions (31/43), and bony perforations were seen in

19 lesions (19/43). The most common initial clinical manifestations were swelling of the maxillary area with or without pain. With some overlaps, clinical manifestations of POMC were presented in Table 4. Concerning treatment method, cyst-enucleation was adopted for 34 patients, and among them, three patients were previously treated via marsupialization (Table 5).

Discussion

POMC is believed to be a long-term complication following radical surgery or trauma associated with the maxillary sinus area. These radical procedures included Caldwell-Luc approach with nasal antrostomy^{4,7}, maxillary sinus bone graft and augmentation for dental implantation^{8,9}, orthognathic surgery^{3,10-12} and any autologous bone graft harvested from respiratory epithelium lining bone tissue⁶. Kubo¹ first reported POMC in 1927 and he proposed two hypotheses

to account for the pathogenesis. One is trapped respiratory mucosa from a previous surgical treatment or trauma and another is retention of fluid forming a space after surgery. Most reports^{13,14} support the first hypothesis. Accurate pathology of POMC has not been proven, but the cavity is lined by respiratory epithelium, which supports the first hypothesis. In our study, 35 patients were given a Caldwell-Luc approach for previously diagnosed chronic maxillary sinusitis. And two patients were given cyst-enucleation for dentigerous cyst and odontogenic kerato-cyst in our department. Another two patients had maxillary bony trauma and received open reduction/internal fixation treatment. Maxillary sinus damage was a common feature among the study's subjects, and it can be assumed that surgical trauma to the maxillary sinus contributed to the development of POMC in all our cases. It is well-known that POMC is uncommon in Western countries but frequently reported in Asia, especially Japan. Kaneshiro et al.¹⁵ thought that the high incidence in Japan could be explained by the prevalence of chronic maxillary sinusitis. Moreover, the Caldwell-Luc procedure was one of the first-choice treatments for maxillary sinusitis in Japan before antibiotics became freely available. But, Basu et al.¹⁶ reported that POMC is not a rare lesion in Western countries and presumed that improper diagnosis may have partly contributed to this geographic disparity.

In this study of 41 patients, 21 were males and 20 were females so no gender predilection was observed. The mean age was 55 years and POMC occurred over a wide age distribution, most frequently in the fifth decade of life. The interval between causal events and time of diagnosis of POMC was most frequently between 30 and 39 years. Kim et al.¹⁷ reported a slight female predilection (male:female, 18:20) of POMC patients, with most in their fourth decade of life. The mean interval between previous surgery and diagnosis of POMC was about 22 years. Yamamoto and Takagi¹⁸ reported that most POMC patients were in their second or third decade of life and the most common interval between previous surgery and diagnosis of POMC

ranged from 10 to 29 years. Basu et al.¹⁶ reported a slight female predilection with most patients in their fourth decade of life. The mean interval between previous surgery and diagnosis was 20 years¹⁴. It can be inferred from these studies that over 20 years elapse after the first surgery or trauma before POMC develops. But in other published studies, POMC developed in less than five years^{12,14,19}. Regardless of these findings, a lengthy interval is required between the causal event to the maxillary sinus and the occurrence of POMC, but the reason for this interval has not been well explained in the literature.

Radiologically, the characteristic features of POMC are unilocular or multilocular cystic radiolucency with a well-defined margin with or without bony perforation. Our study demonstrated a preoperative diagnostic accuracy rate for CT of 57.5% (23/40) and standard radiographs indicated positive findings in 26.8% (11/41) of cases as determined by an oral and maxillofacial radiologist. CT is superior to standard radiographs as a diagnostic modality for POMC. Heo et al.²⁰ reported similar results. In the panoramic view with standard radiographs, the central rays are parallel to the medial and posterior wall of the maxillary sinus and the other walls are superimposed²¹. In Waters' view, the central rays are parallel to the medial wall of the maxillary sinus but anterior and posterior wall areas are superimposed. So, the panoramic view has limitations in diagnosing lesions on the anterior and medial maxillary sinus walls. Waters' view has limitations on identifying lesions on the floor of the maxillary sinus. On POMC diagnosis, the patient's history of maxillary sinus surgery is necessary. In CT images, a bony appearance was evident and information including the location of the lesion, direction of expansion, and sinus involvement could be discerned. So, CT may be indispensable in the diagnosis and evaluation of POMC. In our study, 25.6% (11/43) of lesions were multilocular cystic in appearance and 74.42% (32/43) was unilocular in CT images.

In differential diagnosis, POMC should be distinguished from other cystic lesions like mucous retention cyst, radicular cyst, and odontogenic

keratocyst (OKC). Mucous retention cysts are not found in bony structures and are usually symptom-free. As POMC expands, it could affect the apical area of adjacent teeth. In this situation, it should be differentiated from an inflammatory origin lesion like radicular cyst. When lesions are multilocular in appearance radiographically, it should be differentiated from OKC, which can have ciliated epithelium, but POMC usually does not have keratinizing capacity or a keratinized epithelial lining²²⁾. In this study, the most common initial clinical manifestations were swelling of the maxillary area with or without pain. Paresthesia of the buccal area and oroantral fistula were also reported. Other studies have reported swelling and pain as the most common manifestations¹⁷⁻¹⁹⁾. But headache, proptosis and globe displacement¹³⁾, along with nasal obstruction²³⁾ are also common manifestations. And it should be noted that patients with different symptoms will present for treatment in different departments.

Regarding treatment method, cyst enucleation was adopted for 34 patients (37 lesions), and marsupialization was performed on 15 patients (15 lesions). But in three patients treated via marsupialization, recurrent and prolonged lesions were observed and treated via enucleation. No recurrence was observed after enucleation. Yoshikawa et al.²⁴⁾ insisted that marsupialization may be indicated for the treatment of unilocular cysts with a thin cystic wall and with an extensive bony perforation, or when a cyst is located in a position that is inaccessible by the intraoral approach.

For lesser traumatic injuries, endoscopic surgery was applied for POMC treatment, but this procedure has limitations. Saito et al.²⁵⁾ reported an inability to endoscopically treat POMC located in areas distant from the nasal cavity. So endoscopic surgery is not indicated for POMCs located in inferior or posterior maxillary sinus areas. Another contraindication for endoscopic surgery is where the lateral wall of the inferior nasal meatus is bony and thickened. Cyst enucleation is a Caldwell-Luc-like approach that is not an optimum treatment

modality because it can be a causal event for the formation of another POMC. Other surgical options for the maxillary sinus area are of concern, so avoidance of maxillary sinus trauma whenever possible could be more beneficial to patients. When maxillary sinus surgery is necessary, details about the possibility of the occurrence of POMC should be given to the patient as part of the preoperative consent procedure. Due to the lengthy interval between surgery and the appearance of POMC, a means for long-term clinico-radiological follow-up is needed.

Conclusion

In this study, we examined the clinical characteristics of POMC in 41 patients. POMC presented multiple clinical symptoms and radiological features. Most of the cases in this study were treated with surgical enucleation without serious complications. The more conservative approach with endoscopic marsupialization was applied where indicated.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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References

1. Kubo I. A buccal cyst occurred after a radical operation of the maxillary sinus. *Z F Otol Tokyo*. 1927;33: 896-7.
2. Gregory GT, Shafer WG. Surgical ciliated cysts of the maxilla: report of cases. *J Oral Surg (Chic)*. 1958; 16: 251-3.
3. Hayhurst DL, Moenning JE, Summerlin DJ, Bussard DA. Surgical ciliated cyst: a delayed complication in a case

- of maxillary orthognathic surgery. *J Oral Maxillofac Surg.* 1993; 51: 705-8; discussion 708-9.
4. Hasegawa M, Saito Y, Watanabe I, Kern EB. Postoperative mucoceles of the maxillary sinus. *Rhinology.* 1979; 17: 253-6.
 5. Imholte M, Schwartz HC. Respiratory implantation cyst of the mandible after chin augmentation: report of case. *Otolaryngol Head Neck Surg.* 2001; 124: 586-7.
 6. Ragsdale BD, Laurent JL, Janette AJ, Epker BN. Respiratory implantation cyst of the mandible following orthognathic surgery. *J Oral Maxillofac Pathol.* 2009; 13: 30-4.
 7. Noyek AM. Radiology of the maxillary sinus after Caldwell-Luc surgery. *Otolaryngol Clin North Am.* 1976; 9: 135-51.
 8. Kim JJ, Freire M, Yoon JH, Kim HK. Postoperative maxillary cyst after maxillary sinus augmentation. *J Craniofac Surg.* 2013; 24: e521-3.
 9. Lockhart R, Ceccaldi J, Bertrand JC. Postoperative maxillary cyst following sinus bone graft: report of a case. *Int J Oral Maxillofac Implants* 2000; 15: 583-6.
 10. Amin M, Witherow H, Lee R, Blenkinsopp P. Surgical ciliated cyst after maxillary orthognathic surgery: report of a case. *J Oral Maxillofac Surg.* 2003; 61: 138-41.
 11. Thio D, Phelps PD, Bath AP. Maxillary sinus mucocele presenting as a late complication of a maxillary advancement procedure. *J Laryngol Otol.* 2003; 117: 402-3.
 12. Sugar AW, Walker DM, Bounds GA. Surgical ciliated (postoperative maxillary) cysts following mid-face osteotomies. *Br J Oral Maxillofac Surg.* 1990; 28: 264-7.
 13. Billing KJ, Davis G, Selva D, Wilscek G, Mitchell R. Post-traumatic maxillary sinus mucocele. *Ophthalmic Surg Lasers Imaging.* 2004; 35: 152-5.
 14. Cano J, Campo J, Alobera MA, Baca R. Surgical ciliated cyst of the maxilla. Clinical case. *Med Oral Patol Oral Cir Bucal.* 2009; 14: E361-4.
 15. Kaneshiro S, Nakajima T, Yoshikawa Y, Iwasaki H, Tokiwa N. The postoperative maxillary cyst: report of 71 cases. *J Oral Surg.* 1981; 39: 191-8.
 16. Basu MK, Rout PG, Rippin JW, Smith AJ. The postoperative maxillary cyst. Experience with 23 cases. *Int J Oral Maxillofac Surg.* 1988; 17: 282-4.
 17. Kim HY, Dhong HJ, Min JY, Jung YG, Park SH, Chung SK. Postoperative maxillary sinus mucocele: risk factors for restenosis after surgery and preventive effects of mytomicin-C. *Rhinology.* 2009; 47: 79-84.
 18. Yamamoto H, Takagi M. Clinicopathologic study of the postoperative maxillary cyst. *Oral Surg Oral Med Oral Pathol.* 1986; 62: 544-8.
 19. Weber R, Keerl R, Draf W. Endonasal endoscopic surgery of maxillary sinus mucoceles after Caldwell-Luc operation. *Laryngorhinootologie.* 2000; 79: 532-5.
 20. Heo MS, Song MY, Lee SS, Choi SC, Park TW. A comparative study of the radiological diagnosis of postoperative maxillary cyst. *Dentomaxillofac Radiol.* 2000; 29: 347-51.
 21. Ohba T, Yang R, Chen C, Ogawa Y, Katayama H. Experimental explanation of maxillary sinus radiopacity as seen by Waters' and panoramic projections. *Dentomaxillofac Radiol.* 1985; 14: 133-6.
 22. Yamazaki M, Cheng J, Nomura T, Saito C, Hayashi T, Saku T. Maxillary odontogenic keratocyst with respiratory epithelium: a case report. *J Oral Pathol Med.* 2003; 32: 496-8.
 23. Lee JY, Baek BJ, Byun JY, Shin JM. Long-term efficacy of inferior meatal antrostomy for treatment of postoperative maxillary mucoceles. *Am J Otolaryngol.* 2014; 35: 727-30.
 24. Yoshikawa Y, Nakajima T, Kaneshiro S, Sakaguchi M. Effective treatment of the postoperative maxillary cyst by marsupialization. *J Oral Maxillofac Surg.* 1982; 40: 487-91.
 25. Saito T, Ikeda T, Kono Y, Ohtsubo T, Noda I, Saito H. Implications of endoscopic endonasal surgery for the treatment of postoperative maxillary mucoceles. *ORL J Otorhinolaryngol Relat Spec.* 2000; 62: 43-8.