

ORIGINAL ARTICLE



Is dental evaluation considered in unilateral maxillary sinusitis? A retrospective case series

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ABSTRACT

Objective: Are patients with symptomatic unilateral maxillary sinusitis sent for a dental evaluation of odontogenic maxillary sinusitis (OMS)?

Patients and methods: The medical records of all patients diagnosed with sinusitis at a university Ear-nose and throat (ENT) clinic from 2010 to 2015 were scrutinized for symptomatic unilateral maxillary sinusitis verified on CT. Any dental evaluation was recorded, as well as symptoms of OMS, duration to dental evaluation, diagnosis of OMS and dental treatment.

Results: A total of 1338 patients diagnosed with sinusitis were screened; 172 had unilateral maxillary sinusitis and 48% (82/172) OMS. 34% did not have any dental evaluation at all. Patients referred to local specialist dental care waited a median of 11 weeks for evaluation and a median of 15 weeks further for dental treatment. Symptoms more frequently reported in OMS patients were foul smell or taste (43.9% vs 11.1%, $p < .0001$), purulent rhinorrhea (40% vs 19.1%, $p = .015$) than non-OMS patients. The OMS group also reported more frequently that they were active smokers (31.7% vs 10%, $p = .0005$).

Conclusions: OMS was found in 48% of unilateral maxillary sinusitis and one-third of the patients with unilateral maxillary sinusitis had no dental evaluation. Low awareness of OMS could delay diagnosis and treatment.

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Introduction

CT-verified unilateral maxillary sinusitis is a common medical condition both in primary care and in Ear-nose and throat (ENT) specialist care. Dental diseases are an important cause of unilateral maxillary sinusitis, called odontogenic maxillary sinusitis (OMS), and the correct diagnosis and treatment often leads to the complete resolution of the symptoms and the disease [1–3]. Unilateral maxillary sinusitis can also be a sign of more severe sinus disease, such as sino-nasal tumours. OMS is therefore an important diagnosis to verify or exclude. In spite of this, OMS is reported to be frequently overlooked in the initial assessment of unilateral maxillary sinusitis which can lead to a delayed diagnosis and treatment [4,5].

There is a close distance between the posterior maxillary teeth and the maxillary sinus and OMS occurs when an infectious process from the teeth extends into the maxillary sinus [3,6,7]. Trauma to the maxilla, such as a dental trauma, a tooth extraction or the placement of dental implants, may cause OMS [8,9]. OMS is a prevalent disease and has been estimated to affect 10–41% of all patients with sinusitis [2,3,9–12]. OMS is, however, poorly described in the current guidelines for rhinosinusitis [2] and it is only briefly mentioned in the European position paper on rhinosinusitis and nasal polyposis (EPOS) [13].

Accordingly, there is a lack of consensus regarding the diagnostic criteria for OMS. One of the most consistent findings in OMS is unilateral maxillary sinus opacification on CT. Most studies have used *plain dental x-rays* to diagnose OMS, but plain x-rays do not have high sensitivity in detecting dental disease compared with a CT scan. Using plain x-rays may thus underdiagnose OMS [2]. Recent studies including CT scans have found OMS in up to 70% of unilateral maxillary sinusitis [14,15].

OMS is typically unilateral, but it may occasionally be bilateral [2,16,17]. Most bilateral sinus disease is rhinogenic such as allergic or non-allergic rhinosinusitis, but rhinogenic sinusitis can also be unilateral [11]. To add to the confusion, the symptoms of OMS are non-specific and can also be present in rhinogenic sinusitis [8] including symptoms from the teeth [2,5]. Consequently, OMS is often misdiagnosed as rhinogenic sinusitis [18].

The aim of this study was to assess the extent of patients with unilateral maxillary sinusitis that are referred for a dental evaluation to exclude OMS at a university ORL clinic in Sweden.

Patients and methods

This is a retrospective study of the medical records from the Department of ENT, Head & Neck Surgery at Sahlgrenska

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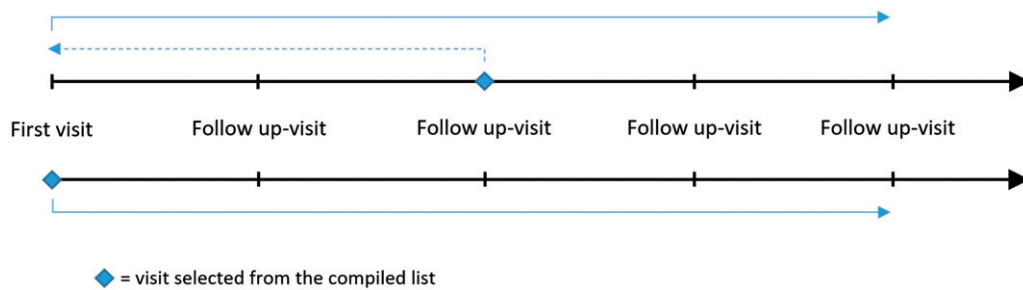


Figure 1. Time line illustrating the inclusion of patients based on visits to the university ENT clinic in 2010–2015. The dashed blue arrow represents the tracing-back process to the first visit in the medical records when a follow-up visit was identified. All the included patients were followed in the medical records from their first to their last visit (the solid blue arrows).

Table 1. Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Unilateral maxillary sinus opacification on CT that could extend into the anterior ethmoidal sinuses and/or frontal sinus on the same side	Other sinus opacification on CT such as contralateral opacification
≥18 years of age	<18 years of age
Referred on suspicion of sinusitis	Under investigation in 2015
Diagnosed as unilateral sinusitis at tertiary ENT clinic	Sinonasal tumors
	Mucocele
	Granulomatosis with polyangiitis (Wegener's granulomatosis)
	Sinus polyps
	Primary ciliary dyskinesia (Kartagener's syndrome)
	Cystic fibrosis
	Silent sinus syndrome
	Severely altered sinus anatomy due to trauma
	Severely altered anatomy of the medial sinus wall

Table 2. Baseline data of the 172 patients referred to the university ENT clinic in 2010–2015 because of unilateral maxillary sinusitis.

Total: n = 172	n (%)
Mean age, years	53 (SD =17)(max =89, min =18)
Female/male	99/73 (58)
Side of pathology on CT left/right	94/78 (55)
OMS/no OMS	82/90 (48)
– OMS female	47/82 (57)
– OMS male	35/82 (43)
Referral from:	
– GP	64/172 (37)
– ENT specialist	53/172 (31)
– Other specialists	37/172 (22)
– Dentist (family or specialist)	14/172 (8)
– Self-referral/emergency cases	4/172 (2)
Active smoking	35/172 (20)
– OMS	26/82 (32)
– Non-OMS	9/90 (10)

OMS: odontogenic maxillary sinusitis.

University Hospital, which is a tertiary university referral clinic in Sweden serving a region of about 1.6 million inhabitants (www.vgregion.se/en/Vastra-Gotalandsregionen/Home/). All visits in 2010–2015 with ICD-10 codes of J32.0 (chronic maxillary sinusitis), J32.8 (other chronic sinusitis) and J32.9 (chronic sinusitis, unspecified) were scrutinized for unilateral maxillary sinusitis verified by a unilateral sinus opacification on CT. The visits identified during this period were both first visits and follow-up visits. When a patient was identified as having unilateral maxillary sinusitis according to the inclusion and exclusion criteria, he/she was followed back to the first visit (which in some patients was before 2010), as well as to the last visit recorded until 2015, Figure 1. The patients were included consecutively. At the visit to the university ENT

clinic, all patients were assessed by an ENT specialist or ENT resident. The clinical visit included a review of the medical history including sino-nasal symptoms, findings on the CT sinus scan and a nasal endoscopy.

The inclusion and exclusion criteria are shown in Table 1. To summarize, adult patients (≥18 years of age) with a unilateral maxillary sinus opacification on CT that could extend to the anterior ethmoidal sinuses and the frontal sinus on the same side and sino-nasal symptoms were included [2,19].

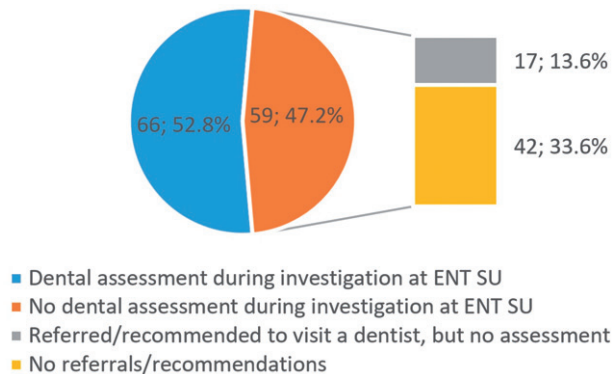
Definition of OMS: Patients having a predominantly unilateral sinus opacification on CT, and sinus symptoms were defined as having OMS by the ENT specialist if 1. dental pathology was diagnosed by a dentist in relation to the affected sinus, 2. if the patient had a history of dental disease or dental treatment of the upper jaw on the same side in temporal relation to the symptom onset and CT finding or 3. radiological signs of a dental abscess or an oro-antral communication on the CT scan.

For each patient, the date of referral to the university ENT clinic was recorded, as well as any referral to a dentist prior to or after the assessment at the university ENT clinic. The date of the diagnosis of OMS was set as the date of the dental evaluation when dental pathology was confirmed. This was only available for patients referred from the university ENT clinic to a specialist dental clinic (for example, an oral surgeon or an endodontist). For dental evaluations made prior to referral to the university ENT clinic, no date was available in the medical records. The date on which the GP/other ENT/other specialist referred the patient to the university ENT clinic was used as the date of visit to the

Table 3. Dental evaluation prior to visit at the university ENT clinic by referring unit.

Referrals	<i>n</i> = 172	Dental evaluation <i>n</i> (%)	OMS <i>n</i> (%)	No dental evaluation <i>n</i> (%)
GP	<i>n</i> = 64	10 (16)	6/10 (60)	54 (84)
Other ENT specialists	<i>n</i> = 53	20 (38)	12/20 (60)	33 (62)
Other specialists ^a	<i>n</i> = 37	3 (8)	2/3 (67)	34 (92)
Dentist	<i>n</i> = 14	14 (100)	13/14 (93)	0 (0)
Self-referral/emergency cases	<i>n</i> = 4	0 (0)		4 (100)
Total	<i>n</i> = 172	47 (27)		125 (73)

GP: general practitioner.

^aOther specialties: Rheumatology (3), Neurology (4), Internal medicine (15), Psychiatry (2), Dermatology (2), Infectious diseases (1), Ophthalmology (2), General surgery (3), Occupational medicine (3), Oncology (1), Unclear (1).**Figure 2.** Pie chart of dental evaluations made in the patients with unilateral maxillary sinusitis seen at the university ENT clinic without a prior dental evaluation in primary care (*n* = 125). ENT SU = Department of ENT, Sahlgrenska University Hospital.

GP/other ENT/other specialist. Symptoms of sinusitis were also recorded, as well as a history of smoking and comorbidities and any dental treatment performed.

The study was approved by the local ethics committee in Gothenburg, Dnr 604-16.

Statistics

Symptoms, active smoking and comorbidities were compared between patients defined as having OMS (OMS) and patients defined not having OMS or not being assessed by a dentist (non-OMS) using Fisher's exact test. *p* Values (two-tailed) of <.05 were considered significant. All statistical analyses were performed using the Analysis Toolpak in Microsoft Excel 2016 and the IBM SPSS Statistics version 24 statistical software.

Results

In all, the medical records of 1338 patients were identified with the ICD-10 codes of J 32, J32.8 and J32.9 during the period 2010–2015. After scrutinizing the medical records and CT scans, 172 patients were identified as having unilateral maxillary sinusitis and were eligible according to the inclusion and exclusion criteria. The baseline data for the included patients are shown in Table 2. Only 16% of the patients referred by GPs to the university ENT clinic had a dental evaluation before the referral, while 38% of the patients referred by ENT specialists had a dental evaluation prior to referral, Table 3. Patients referred by family dentists or dental specialists had OMS in 93% of cases (13/14), while

34% of all the patients referred to the university ENT clinic had no dental evaluation, Figure 2. The different time lags in whole weeks are presented in Table 4. Purulent rhinorrhea, foul smell/taste and a predominance of unilateral symptoms were all significantly more common in OMS, Table 5, as well as active smoking, Table 2, Figure 3.

Discussion

In this consecutive case series of 172 patients with unilateral maxillary sinusitis referred to a university ENT clinic in Sweden, 48% had OMS. One-third of the patients were never evaluated by a dentist. The results confirm that OMS is common in unilateral maxillary sinusitis, but it is often overlooked by both primary care and ENT specialist care.

The high prevalence of OMS in this study matches previous studies of patients with unilateral maxillary sinusitis diagnosed with CT, showing OMS in 40–70% [14,15,20]. The patients who had a dental evaluation prior to being referred to the university ENT clinic had OMS in 70% of cases, whereas the patients who had a dental evaluation after being referred to the university ENT clinic had OMS in 39% of cases. Most importantly, however, 34% of all the patients with unilateral maxillary sinusitis did not have any dental evaluation at all.

The majority of the patients in this study were initially evaluated by their GP, as would be expected. Of these patients, only sixteen percent had a dental assessment before being referred to the university ENT clinic. These patients had OMS in 60% of cases. This suggests that some patients with unilateral maxillary sinusitis have more obvious signs of OMS, resulting in an early referral to the dentist. The patients that were first seen by an ENT specialist in primary care had a dental evaluation more than twice as often. ENT specialists have a clinical interest in sinus disease and would normally perform a nasal endoscopy and look for evidence of sinusitis such as pus, which could contribute to greater diagnostic accuracy. In spite of this, the majority of the patients seen by ENT specialists in primary care in this study were not evaluated by a dentist before being referred to the university ENT clinic. A limited number of patients in this study were referred by dentists to the university ENT clinic due to unilateral maxillary sinusitis. These patients had OMS in 93% of cases. This illustrates the fact that some patients with unilateral maxillary sinusitis and OMS are primarily diagnosed in dental care.

Because of the high prevalence of OMS in patients with unilateral maxillary sinusitis, we would recommend that a

Table 4. Time lags from referral to dentist to diagnosis and dental treatment for patients diagnosed with OMS.

Time lags	Mean (weeks)	Median (weeks)	SD	Min	Max
University ENT clinic referral/recommendation to visit a dentist -> visit to dentist	18	11	33.9	0 ^a	258
Diagnosis of dental origin -> dental treatment ^b	22.4	15	22.6	1	88

^aDentist referral/recommendation to visit a dentist or dental evaluation on the same day or the day after (the time lags were rounded off to the nearest half week (0.5)).

^bIncludes only patients with diagnosed OMS.

Table 5. Symptoms reported by the 172 patients with unilateral maxillary sinusitis.

Symptoms	OMS (n = 82)	Non-OMS (n = 90)	p Value
Rhinorrhea	12 (14.6%)	12 (13.3%)	.829
Unilateral	5	2	
No specific side	7	4	
Purulent rhinorrhea	35 (42.7%)	22 (24.4%)	.015
Unilateral	15	5	
No specific side	20	17	
Nasal congestion	26 (31.7%)	34 (37.7%)	.427
Unilateral	6	3	
No specific side	20	31	
Facial pain/pressure	39 (47.6%)	43 (47.7%)	1.000
Unilateral	28	22	
No specific side	11	21	
Foul smell/taste	36 (43.9%)	10 (11.1%)	<.0001
Post-nasal drip	9 (11.0%)	8 (8.9%)	.800
Cough	4 (4.9%)	6 (6.7%)	.749
Dental symptoms	15 (18.3%)	4 (4.4%)	.006
Hyposmia/anosmia	0 (0%)	3 (3.3%)	.247
Headache	7 (8.5%)	12 (13.3%)	.342
Conductive hearing loss	1 (1.2%)	1 (1.1%)	1.000
Snoring	2 (2.4%)	1 (1.1%)	.606
Nausea	0 (0%)	1 (1.1%)	1.000
Constitutional symptoms	5 (6.1%)	4 (4.4%)	.738
Sinus symptoms (specific symptoms not reported)	1 (1.2%)	4 (4.4%)	.370
Globus sensation	0 (0%)	1 (1.1%)	1.000
Unilateral symptoms in total	54 (65.9%)	32 (35.5%)	.0001

Bold, italic items denotes p Values <.05.

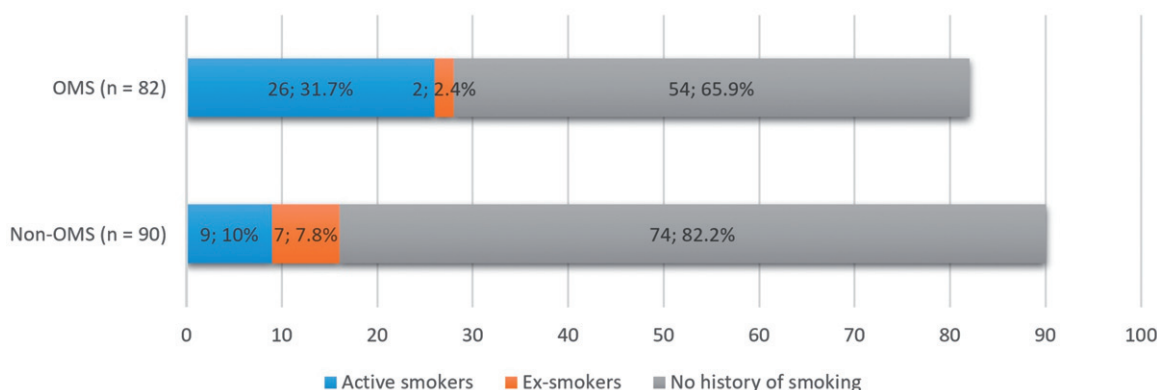


Figure 3. Smoking history.

dental evaluation should be made early in the evaluation of all patients with unilateral maxillary sinusitis verified by CT. It is, however, important that the dentist has access to accurate diagnostic tools and it has been suggested that the use of cone-beam CT or similar 3-D presentations of the dental roots increases the ability to diagnose OMS [21,22]. It is important to recognize that OMS in unilateral maxillary sinusitis is difficult for the clinical physician to rule out without the aid of a qualified dentist. Many studies have shown that the treatment of the dental disease is the only way successfully to resolve OMS [2,5,18]. It has also been suggested that the early management of the odontogenic disease is essential [1,9]. As yet, there are no studies showing

that a dental evaluation in the early stages correlates with a better prognosis of the disease, but patients suffer unnecessarily and may be subject to ineffective, potentially harmful treatment if a proper OMS diagnosis is delayed.

The patients who had a dental evaluation after referral to the university ENT clinic had to wait a median of 11 weeks and another median of 15 weeks before any dental treatment, if OMS was present. In our opinion, this is too long. Many previous studies have highlighted the importance of well-organized collaboration between otorhinolaryngologists and dentists in evaluating and treating OMS [3,9,14,18,23].

The symptoms associated with OMS in this study, such as foul smell/taste, purulent secretion and predominantly

unilateral symptoms, have been associated with OMS before [2] and the prevalence is well in accordance with the study by Lee et al. [9]. Smoking was associated with OMS. The association between tobacco smoking and dental complications is well known and has been studied comprehensively [24]. Smoking is also associated with malignant tumours why the early exclusion of OMS may be especially important in patients with unilateral maxillary sinusitis [25].

This study has several weaknesses that have to be addressed. Primarily, this was a retrospective study of medical records where not all data were available for all patients or recorded in a standardized way. The medical records did, however, come from one university ENT clinic focussing on this patient group and most of the relevant data and examinations were therefore actually recorded. Some of the patients may still have been misclassified. For instance, a dental history could be accidental in relation to the unilateral CT findings and symptoms. OMS has been found to be bilateral in 6% of sinusitis patients, but bilateral sinusitis was excluded in this study [20]. The dental treatment given to the patients with OMS was not investigated, as the medical records only contained short communications on whether treatment had or had not been given. Had dental records been available, a more accurate assessment of OMS would have been possible.

Conclusions

In this consecutive case series of 172 patients with unilateral maxillary sinusitis referred to a university ENT clinic in Sweden, 48% had OMS. One-third of the patients were never evaluated by a dentist. The results confirm that OMS is common in unilateral maxillary sinusitis cases, but it is often overlooked by both primary care and ENT specialist care.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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