Original Article - Retrospective Study

Unilateral Sinus Disease: Not Just Odontogenic! - A Retrospective Study

Manlio Galiè, Simona Gueli[1], Andrea Ciorba[1], Chiara Bianchini[1], Giannicola Iannella[2], Francesco Stomeo[1], Luisa Valente, Stefano Pelucchi[1]

Department of Cranio-Maxillofacial Surgery, Unit of Cranio-Maxillofacial Surgery, University Hospital of Ferrara, [1]Department of ENT, ENT Unit, University Hospital of Ferrara, Ferrara, [2]Department of Head-Neck and Oral Surgery, Head-Neck and Oral Surgery Unit, Morgagni-Pierantoni Hospital, Forlì, Italy

Abstract

Introduction: Unilateral sinus disease (USD), and especially unilateral maxillary sinusitis (UMS), is an increasingly common finding in the ear, nose, and throat and maxillofacial practice. The aim of this retrospective study was to describe the clinical features of a series of patients affected by USD and, in particular, UMS due to sinonasal anatomic anomalies and of odontogenic origin. **Materials and Methods:** A total of 292 patients affected by UMS were reviewed. Medical charts, radiological images, and surgical notes were all reviewed, particularly including data on UMS due to sinonasal anatomic anomalies and on UMS of odontogenic origin. **Results:** A total of 66 patients have been excluded due to a diagnosis of malignant disease or other benign-defined etiology. Forty-eight patients (21.2%) affected by UMS due to sinonasal anatomic anomalies, whereas 178 (78.8%) patients affected by an odontogenic sinusitis. All patients were surgically treated by functional endoscopic sinus surgery, often in combination with a maxillofacial approach. **Discussion:** UMS of odontogenic origin represented the greater group of USD. Computed tomography scans are always recommended to define UMS etiology (in particular excluding a malignant origin) and also to plan the most adequate surgical treatment.

Keywords: Functional endoscopic sinus surgery, surgery, treatment, unilateral maxillary sinusitis, unilateral sinus disease

Introduction

Unilateral sinus disease (USD), and in particular unilateral maxillary sinusitis (UMS), is an increasingly common finding in the ear, nose, and throat (ENT) and maxillofacial practice. Bilateral sinusitis is much more frequent than USD.[1] In the past years, USD of odontogenic origin has been reported to be increased, with a reported USD incidence ranging between 10% and 12% of cases up to 50%–75%, according to different authors.[2]

Excluding malignant causes (many authors suggest that every USD must be considered malignant until proven otherwise),[1] USD can occur due to a benign identified etiology (such as antrochoanal polyps, inflammatory polyps, and invasive mycosis) or due to sinonasal anatomic anomalies or odontogenic disease.[1,2] Patients affected usually report unilateral symptoms such as nasal congestion/obstruction, local pain, and anterior or posterior nasal drip.[1,2]

The aim of this study is to evaluate retrospectively the clinical features of a series of patients affected by UMS, at our university setting, particularly focusing on UMS due to sinonasal anatomic anomalies and on UMS of odontogenic origin.

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Materials and Methods

This was a retrospective study. The clinical charts of a total of 292 patients affected by UMS between January 1, 2012, and January 30, 2019, and referred to our ENT and maxillofacial departments have been reviewed.

Inclusion criteria were: (i) patients undergoing surgery for UMS between January 1, 2012 and January 30, 2019 (ii) age >18 years old.

Exclusion criteria were: (i) patients undergoing surgery due to a diagnosis of a benign identified etiology (in particular, antrochoanal polyps, inverted papilloma, and invasive mycosis) (ii) lymphoma or a malignant preoperatory histology.

Address for correspondence: Dr. Luisa Valente, Maxillo-Facial Unit, University Hospital of Ferrara, Ferrara, Italy.
E-mail: luisavalente@outlook.it

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Medical charts, clinical data, nasal endoscopic, radiological images, and surgical notes were all reviewed, retrospectively. In particular, according to the clinical and radiological features of the maxillofacial computed tomography (CT) scans, UMS was divided into (i) UMS of odontogenic origin and (ii) UMS due to sinonasal anatomic anomalies.

Radiological criteria to define a UMS of odontogenic origin were the presence of periapical radiolucency around the teeth, indicating periodontal disease; the presence of a oroantral fistula; and the presence of dental implants through the maxillary sinus (MS).

Radiological criteria to define a UMS due to sinonasal anatomic anomalies were the presence of septal deviation, concha bullosa, or sinus hypoplasia.

UMS of odontogenic origin was usually treated in combination by the ENT surgeon and by the maxillofacial surgeon. UMS due to sinonasal anatomic anomalies was usually treated by the ENT surgeon only.

ENT treatment consisted of a functional endoscopic sinus surgery (FESS), which included uncinectomy, medial meatal antrostomy, and when necessary an anterior and/or posterior ethmoidectomy. In some cases, FESS was completed by a mini Caldwell-Luc access. In case of UMS, due to sinonasal anatomic anomalies, the treatment also included the anatomical correction (i.e., septoplasty and/or turbinoplasty).

The maxillofacial treatment varied in relation to the odontogenic origin; dental infections originating from the apex of a root protruding into the antral floor were treated with endodontic therapy of the infected tooth and apicoectomy with the removal of the pathological periapical tissues. For the enucleation of odontogenic cysts (radicular and dentigerous), a Caldwell-Luc approach was the treatment of choice. UMS developed due to the displacement into the sinus of foreign bodies (i.e., dental roots, endodontic material, and dental implant) required foreign-body removal, often achieved with a combined approach. Surgical approach for UMS due to MS bone grafting or sinus lift procedure required grafting material removal, the concomitant partial removal of the sinus membrane, and closure of residual oroantral communication.[1] Finally, oroantral communications following dental extraction or removal of a dental implant, as well as chronic forms with oroantral fistula, required revision of the surgical site, which included freshening of the wound edges and/or excision of the fistulous tract, mobilizing and advancement of the pedicled buccal fat pad, and closure of the flap in two layers with resorbable sutures.

Follow-up consisted of ENT and/or maxillofacial evaluation for 8–12 months after surgery on average.

The research was conducted in compliance with the Helsinki Declaration (2008). It was performed retrospectively through a systematic hospital case file review and therefore did not affect patient care in any way. However, all participants were informed about the project during consequent visits and provided their participation consent.

Results

A total of 292 patients received a diagnosis of UMS; of these, 66 have been excluded due to a diagnosis of malignant disease or benign etiology (in particular, 42 antrochoanal polyps, 13 inverted papilloma, 1 ex-inverted papilloma carcinoma, 3 invasive mycosis, 2 lymphoma, 1 sinus adenocarcinoma, 1 adenoidocystic carcinoma, 1 poorly differentiated carcinoma, and 2 squamous carcinoma).

Therefore, a total of 226 patients have been included; 116 (51.33%) were males and 110 (48.67%) were females, and the mean age was 49.1 years.

The sample was divided into two categories, according to the above-mentioned criteria: (i) UMS of odontogenic origin (178 patients) and (ii) UMS due to sinonasal anatomic anomalies (48 patients).

Unilateral maxillary sinusitis due to sinonasal anatomic anomalies

Forty-eight patients (21.2%) affected by UMS due to sinonasal anatomic anomalies were identified. Twenty-one were males (43.8%) and 27 (56.2%) were females. Radiological images disclosed an involvement of the right MS in 25 patients (52.1%) and of the left in 23 (47.9%) patients. In 27 (56.3%) patients, there also was an involvement of the adjacent paranasal sinus. Eighteen (37.5%) patients disclosed pollen allergies. Reviewing the medical records, 42 (87.5%) patients declared nasosinusal symptoms such an unilateral obstruction, rhinorrhea with or without postnasal drip, and headache with pain at the nasosinusal trigger points; six patients did not declare nasosinusal symptoms, and UMS was found accidentally (one of these due to the occurrence of a meningitis). Symptoms at diagnosis and patients' preoperative features have been reported in Table 1.

In 47 patients, a specific anatomic etiology was found, whereas in one case, UMS was due to trauma [Table 2].

Surgical treatment included uncinectomy, medial meatal antrostomy, and anterior and/or posterior ethmoidectomy when necessary, by means of nasal scopes (rigid 0°, 30°, and 45° endoscopes) and finally the correction of the anatomic cause.

In some cases, histological examination was performed, disclosing nine hyperplastic polypoid sinusitis, one maxillary cyst, and one MS mucocele.

At the follow-up, there were no recurrences for this group.

Unilateral maxillary sinusitis of odontogenic origin

One hundred and seventy-eight (78.8%) patients affected by odontogenic sinusitis were identified; 95 were males (53.4%) and 83 were females (46.6%). In 47 patients (45.2%), there was an involvement of the right MS and of the left in 57 patients (54.8%). Reviewing the medical records,

Table 1: Preoperative features of patients affected by unilateral maxillary sinusitis due to sinonasal anatomic anomalies

Variables	*n* (%)
Sex	
Male	21 (43.8)
Female	27 (56.2)
Side	
Right	25 (52.1)
Left	23 (47.9)
Involvement of adjacent paranasal sinus	27 (56.3)
Symptoms	
Nasosinusal (nasal obstruction, purulent rhinorrhea, postnasal drip, trigger points pain headache)	42 (87.5)
Asymptomatic	5 (10.4)
Complications (meningitis)	1 (2.1)
Allergy	18 (37.5)

Table 2: Etiology of unilateral maxillary sinusitis due to sinonasal anatomic anomalies

Etiology	*n* (%)
Anatomic	
Septal deviation	36 (75)
Concha bullosa	24 (50)
Paradoxical middle turbinate	5 (10.4)
Pneumatized uncinate process	3 (6.3)
Pneumatized bulla	3 (6.3)
Maxillary sinus hypoplasia	2 (4.2)
Traumatic	
Foreign bodies	1 (2.1)

117 (65.7%) patients declared nasosinusal symptoms, and 61 (34.3%) patients presented odontogenic symptoms (such as pyorrhea, swelling of the mouth vestibule, and toothache). Symptoms at diagnosis and patients' preoperative features are reported in Table 3.

In case of UMS of odontogenic origin, infection due to dental extraction-related complications was the most common etiology [Table 4]; the most affected teeth are shown in Table 5.

The preoperative nasal endoscopy, together with intraoperative findings, was shown purulent rhinorrhea in 56.3% of the cases and hyperplastic mucosa/polyposis in 24.2% of the cases.

Surgical treatment included a FESS often in combination with a maxillofacial approach. In particular, FESS only was performed in 22 patients (12.4%) and FESS with maxillofacial approach in 152 patients (85.4%); of these, 35 patients (19.7%) were treated by a Caldwell-Luc approach.

At the follow-up, we noticed four recurrences, registered after 5 months in one case, after 12 months in 2 cases, and after 24 months in the latter; these were all surgically treated.

Table 3: Preoperative features of patients affected by odontogenic sinusitis

Variables	*n* (%)
Sex	
Male	95 (53.4)
Female	83 (46.6)
Side	
Right	47 (45.2)
Left	57 (54.8)
Symptoms	
Nasosinusal (nasal obstruction, purulent rhinorrhea, postnasal drip, trigger points pain headache)	117 (65.7)
Odontogenic (pyorrhea, swelling of the mouth vestibule, and toothache)	61 (34.3)

Table 4: Etiology of unilateral maxillary sinusitis of odontogenic origin

Etiology	Percentage
Iatrogenic causes	
Dental extraction-related complications	19.7
Dental implant-related complications	10.7
Foreign bodies	3.9
Sinus bone grafts	2.3
Trauma outcomes	1.7
Primitive odontogenic causes	
Infections (dental abscesses and periodontal disease)	21.9
Radicular cyst	12.9
Dentigerous cyst	4.5
Supernumerary tooth	1.7

Discussion

UMS can be due to different pathologies, and as already reported, must be considered malignant until proven otherwise.[1] Sometimes, clinical symptoms could already suggest the presence of a malignant etiology (i.e., persistent epistaxis, facial or cheek swelling, and cranial nerve involvement), while radiologically, the presence of bone erosion at CT scan is usually highly suspicious.[1-3]

In the presented series, we retrospectively investigated 226 cases of UMS surgically treated, due to sinonasal anatomic anomalies or of odontogenic origin, the latter representing the greater group. These data are similar to that of other previous studies, in which the incidence of odontogenic UMS is reported to range between 50% and 75%.[2] The average age of patients in our study was similar to that reported in the literature, while we noticed a slight male predominance.[2,4]

Concerning the reported symptoms, 66% of the patients of our series declared sinonasal symptoms, whereas 34% of the patients declared dental symptoms, as reported in the literature.[5-11] It is also interesting to notice that dental symptoms, such as pain or dental hypersensitivity, do not reliably predict an odontogenic etiology.[11] Hence, rather

Table 5: Unilateral maxillary sinusitis of odontogenic origin: most affected teeth in the presented series

Affected teeth	Percentage
First molar	32.9
Second molar	32.9
Third molar	16.4
Second premolar	10.7
First premolar	5
Canine	2.1

than symptoms, clinical history could usually suggest the etiology; an odontogenic origin should be suspected, especially if a dental procedure was performed in the past.[2-6]

In our study, concerning odontogenic UMS, an iatrogenic odontogenic etiology (implantological treatments, tooth extraction, and grafts) was present in 33% of the patients, whereas a primitive odontogenic pathology was present in 44% of the sample. The most involved teeth were first and second molar, followed by the third molar and the second premolar; this finding is similar to that described in the literature.[4] This feature can be explained embryologically, as the MS begins to develop from the 3rd month of intrauterine life and reaches a volume of 15–20 ml around the age of 12–14 years,[5,9,10] extending from the orbital floor to the dentoalveolar segment of the maxillary, above the canine till the third molar.[10] During the adult life, the MS can continue to expand, incrementing the number of dental elements protruding within the sinuses only covered by periosteum.[5,9,10]

Concerning the treatment, while it is clear that UMS due to sinonasal anatomic anomalies requires a FESS approach correcting the anatomic cause, in case of odontogenic UMS, many studies have emphasized the dental treatment as the first approach.[7,8] However, more recently, other studies have reported that FESS alone can be effective, especially when there is a migration of endodontic material, which can be easily reached by FESS, also to collect some purulent discharge for a culture test and a subsequent targeted antibiotic therapy.[9-11] Despite the latest recent data, several authors also report excellent results with the use of a combined approach (sinonasal and dental treatment); however, there is no clear indication on which of the two treatments should be the first.[5,8-11] It is clear that, to prevent the sinusitis recurrence, the source of the infection should be cleared off: depending on the situation, there are different surgical options.[11] For example, a sinus inflammation can result from an infection (usually involving molars or premolars) that originates from the apex of a root protruding into the antral floor; an endodontic treatment of the infected tooth and apicoectomy are the treatment of choice. An infected odontogenic cyst (radicular and dentigerous) must be enucleated by a radical MS approach (i.e., Caldwell-Luc that provides maximal exposure for the removal of a large cyst.[12-16] Furthermore, oroantral communications due to a dental extraction or due to the removal of a dental implant require revision of the surgical site.[14] Primary closure is indicated and can generally be achieved by surgical techniques such as buccal advancement flaps, palatal island flaps, full- or split-thickness palatal pedicle flaps, or buccal fat pad pedicle flaps.[11]

Most of our cases were treated by a combined maxillofacial and ENT approach (i.e., Caldwell-Luc). In 13% of cases, in which only nasal-sinus surgery was performed, subsequent dental treatment was recommended.

Conclusion

USD, and in particular UMS, is an increasingly common finding in the ENT and maxillofacial practice. Excluding malignant causes, USD can occur due to a number of benign identified etiology such as sinonasal anatomic anomalies or odontogenic disease, in particular, as in the presented series.

Imaging and maxillofacial CT scans, in particular, are always recommend to define the USD etiology (in particular excluding a malignant origin) and to plan the surgical treatment, which could also include a combined maxillofacial and ENT approach, especially in case of odontogenic UMS, as in the presented series.

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Conflicts of interest

There are no conflicts of interest.

References

1. Paz Silva M, Pinto JM, Corey JP, Mhoon EE, Baroody FM, Naclerio RM. Diagnostic algorithm for unilateral sinus disease: A 15-year retrospective review. Int Forum Allergy Rhinol 2015;5:590-6.
2. Grygorov S, Poberezhnik G, Grygorova A. Actual issues of odontogenic maxillary sinusitis (review). Georgian Med News 2018;276:46-50.
3. Castelnuovo P, Battaglia P, Simoncello F. Quando è necessaria la chirurgia. [When surgery is necessary] Argomenti di Acta Otorhinolaryngol Ital 2008;2:46-9.
4. Little RE, Long CM, Loehrl TA, Poetker DM. Odontogenic sinusitis: A review of the current literature. Laryngoscope Investig Otolaryngol 2018;3:110-4.
5. Brook I. Sinusitis of odontogenic origin. Otolaryngol Head Neck Surg 2006;135:349-55.
6. Troeltzsch M. Pache C, Troeltzsch M, Kaeppler G, Ehrenfeld M. Etiology and clinical characteristics of symptomatic unilateral maxillary sinusitis: A review of 174 cases. J Craniomaxillofac Surg 2015;43:1522-9.
7. Wang KL, Nichols BG, Poetker DM, Loehrl TA. Odontogenic sinusitis: A case series studying diagnosis and management. Int Forum Allergy Rhinol 2015;5:597-601.
8. Jiam NT, Goldberg AN, Murr AH, Pletcher SD. Surgical treatment of chronic rhinosinusitis after sinus lift. Am J Rhinol Allergy 2017;31:271-5.
9. Lee KC, Lee SJ. Clinical features and treatment of odontogenic sinusitis. Yonsei Med J 2010;51:932-937.
10. Mehra P, Jeong J. Maxillary sinusitis of odontogenic origin. Curr Allergy Asthma Rep 2009;9:238-43.
11. Simuntis R, Kubilius R, Vaitkus S. Odontogenic maxillary sinusitis: A review. Stomatologija 2014;16:39-43.
12. Chirilă L, Rotaru C, Filipov I, Săndulescu M. Management of acute maxillary sinusitis after sinus bone grafting procedures with

simultaneous dental implants placement: A retrospective study. BMC Infect Dis 2016;16 Suppl 1:94.
13. Pagella F, Emanuelli E, Pusateri A, Borsetto D, Cazzador D, Marangoni R, *et al*. Clinical features and management of antrochoanal polyps in children: Cues from a clinical series of 58 patients. Int J Pediatr Otorhinolaryngol 2018;114:87-91.
14. Borsetto D, Ciorba A, Cazzador D, Volo T, Denaro L, D'Avellal ED, *et al*. Transnasal endoscopic management of anterior cerebrospinal fluid (CSF) leak: Experience from a large case series. B-ENT 2017;13:15-21.
15. Ugincius P, Kubilius R, Gervickas A, Vaitkus S. Chronic odontogenic maxillary sinusitis. Stomatologija 2006;8:44-8.
16. Denes SA, Tieghi R, Elia G. The buccal fat pad for closure of oroantral communication. J Craniofac Surg 2016;27:e327-30.