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Etiology and clinical characteristics of symptomatic unilateral maxillary sinusitis: A review of 174 cases

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ABSTRACT

The purpose of the study was to analyze the causative pathology associated with symptomatic unilateral maxillary sinusitis requiring surgical treatment.

A retrospective review of all patients that have been treated surgically for unilateral symptomatic maxillary sinusitis between 2006 and 2013 at a single institution was performed. Demographic, anamnesis, clinical, radiological, microbiological and histological data were gathered and analyzed. The patients were allocated into groups depending on the underlying cause of the disease. Descriptive and inferential statistics were computed (level of significance: $p \leq 0.05$).

The study sample was composed of 174 patients (72 female; 102 male) with a mean age of 52.7 years (SD 16.9). Most cases (130; 75%) were triggered by odontogenic pathology following dentoalveolar surgical interventions (83/130 patients; 64%). Other etiological factors for odontogenic unilateral sinusitis were periapical (23/130 cases; 18%) and periodontal pathology (13/130 cases; 10%). Rhinogenic factors for sinusitis were detected in 13 patients (7.5%) and dental implant-associated unilateral maxillary sinusitis was diagnosed in nine patients (5.2%). Four patients (2.3%) had undergone previous sinus augmentation surgery. A leading cause for the sinus infection could not be identified in 18 patients (10%) who all had a history of midfacial surgery. Medication-related osteonecrosis of the jaw (8) and squamous cell carcinoma (2) were incidental findings. There were no differences in the clinical appearance of the disease with respect to its etiology.

Odontogenic causes for maxillary sinusitis must be considered especially in unilateral cases. Maxillary dental implants may induce symptomatic unilateral maxillary sinusitis.

1. Introduction

Although radiological signs of unilateral maxillary sinusitis are frequently observed in daily practice, only a few cases become clinically symptomatic and require treatment in the course of the disease (Habesoglu et al., 2010; Joshua et al., 2013; Matsumoto et al., 2015; Rudralingam et al., 2002). Beside rhinogenic causes for unilateral sinus disease, such as polyps, mucous retention cysts and nasal septum deviation, the majority of clinically evident unilateral maxillary sinusitis cases seem to be provoked by odontogenic pathology and oral surgical procedures (Kim et al., 2015; Lee and Lee, 2010; Matsumoto et al., 2015; Patel and Ferguson, 2012). Dental pathology as a cause for acute or chronic maxillary sinusitis is a well-known clinical problem (Brook, 2006; Patel and Ferguson, 2012; Simuntis et al., 2014). The literature states that about 10% of all sinusitis cases are triggered by odontogenic pathology (Brook, 2006; Ferguson, 2014; Patel and Ferguson, 2012; Simuntis et al., 2014). Periodontal disease, periapical pathology, failed endodontic treatment, pulp necrosis, impacted maxillary teeth and iatrogenic reasons, such as postoperative oroantral communications, have been mentioned as non rhinogenic causative factors of unilateral sinusitis (Lechien et al., 2014; Patel and Ferguson, 2012). However, the topicality of these numbers has

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been questioned recently (Ferguson, 2014; Patel and Ferguson, 2012) and a much higher prevalence of non rhinogenic causes for maxillary sinusitis is suspected (Abrahams and Glassberg, 1996; Bomeli et al., 2009; Hoskison et al., 2012; Longhini and Ferguson, 2011). There are only a few studies that have considered orthognathic surgery, maxillofacial trauma and new developments in oral surgery, such as sinus augmentation procedures and implantology, as possible trigger factors for (unilateral) maxillary sinusitis (Anavi et al., 2008; Garg and Kaur, 2014; Jung et al., 2007; Kayabasoglu et al., 2014; Kim et al., 2015; Lee and Lee, 2010; Manor et al., 2010; Pereira-Filho et al., 2011; Raghoebar et al., 1999; Timmenga et al., 2001, 2003; Top et al., 2004). Therefore, the actual incidence of non rhinogenic sinusitis may be on the rise (Hoskison et al., 2012; Wang et al., 2015).

An inherent problem of many studies investigating the etiology of non rhinogenic maxillary sinusitis is their heterogeneous definition of the disease and inconsistent reporting of unilateral or bilateral involvement (Maillet et al., 2011; Patel and Ferguson, 2012) which limits comparability of the presented data. Several studies reporting high numbers of odontogenic sinusitis are based on the evaluation of radiologic images and fail to correlate these findings with clinical data (Bomeli et al., 2009; Kaplan and Kountakis, 2004; Maillet et al., 2011; Obayashi et al., 2004). Other research disregards implantology, augmentative procedures, orthognathic surgery, clefts and maxillofacial trauma as risk factors for the development of non rhingogenic sinusitis (Longhini and Ferguson, 2011; Pokorny and Tataryn, 2013). In summary, the clinical relevance and topicality of the present data can be questioned.

The purpose of the present study was to clarify the following research question: what is the leading cause for clinically and radiographically diagnosed unilateral maxillary sinusitis that requires surgical treatment? The specific aims of the study were to correlate demographic, anamnesis, clinical and radiological data with histological and microbiological results and intraoperative findings, to determine the underlying reason for sinusitis unambiguously.

2. Material and methods

2.1. Study design and sample selection

The investigators designed a retrospective cohort study to address the research question. All patients who presented to the department of oral and maxillofacial surgery of the Ludwig Maximilian University of Munich, Germany, with a clinically and radiologically confirmed diagnosis of acute or chronic unilateral sinusitis and received surgical treatment between January 2006 and December 2013 were included in the study. Patients with a history of head and neck cancer, radiation in the head and neck area, known immunodeficiency, prior surgical treatment for sinusitis and pregnant women were excluded. The conduct of the study was in accordance with ethical guidelines and approved by the local institutional review board.

2.2. Study variables

The study variables were obtained by review of the patients' charts, radiology, surgical, pathohistological and microbiological reports. The following variables were analyzed: demographic data (patient age, sex), anamnesis data (history of dentoalveolar surgery, midfacial trauma, cleft surgery, maxillary orthognathic surgery, sinus augmentation procedures, implantology in the maxilla; history of pain, discharge, swelling, cacosmia and bitter taste – only the leading clinical symptoms were noted), clinical findings (probable or visible oroantral fistula, significant periodontal and peri-implant probing depths, visible oroantral or nasal purulent discharge), radiological findings (sinus mucosa thickening, sinus fluid, periodontitis, peri-implantitis, periapical pathology, periapical cysts, intraluminal maxillary cysts), histological data (acute, chronic inflammation; signs of allergies), and microbiological data (if specifically notified in the report).

According to the underlying cause of maxillary sinusitis, five groups were defined after thorough analysis of clinical, radiological, histological and microbiological data: (1) maxillary sinusitis of odontogenic origin, (2) of rhinogenic origin, (3) maxillary sinusitis in association with augmentative surgery, (4) with implantology

Table 1
Presentation of demographic, clinical, histological, microbiological and therapeutic data of the examined cohort.

Variable	Descriptive statistics
Total number of patients	$n = 174$
Age	52.7 (SD 16.9) years
Sex	
Male	102 (58.6%)
Female	72 (41.4%)
Symptoms at presentation	
No symptoms	82 (47%)
Pain	51 (30%)
Purulent discharge	29 (16%)
Trismus	2 (1.2%)
Swelling of the cheek	9 (5.2%)
Bitter taste	1 (0.6%)
History of allergic sinusitis	
No	166 (95.4%)
Yes	8 (4.6%)
Type of sinusitis	
Odontogenic	130 (75%)
Implant-associated	9 (5.2%)
Augmentative-surgery associated	4 (2.3%)
Rhinogenic	13 (7.5%)
Post-midfacial surgery	18 (10%)
Pathology associated with sinusitis	
Immediate post-extraction oroantral fistula	60 (34.5%)
Wound healing disturbance after extraction	23 (13.2%)
Deep periodontal pocket	13 (7.5%)
Insufficient endodontic treatment	7 (4.0%)
Periapical odontogenic cystic lesion	16 (9.2%)
Medication-related osteonecrosis of the jaw	8 (4.6%)
Foreign body (luxated root, root filling material)	3 (1.7%)
Peri-implantitis	9 (5.2%)
Post sinus elevation surgery	4 (2.3%)
Non-odontogenic cyst	11 (6.3%)
Prior midfacial surgery (trauma, Le Fort I osteotomy, cleft)	18 (10.3%)
Neoplasm	2 (1.1%)
Histological diagnosis	
Acute inflammation	19 (11%)
Chronic inflammation	105 (60%)
Allergic sinusitis	5 (3%)
Osteonecrosis	8 (4.5%)
Squamous cell carcinoma	2 (1.5%)
Not obtained	35 (20%)
Microbiology	
Non-specified mixed oral flora	151 (86.8%)
Streptococcus spp.	5 (2.9%)
Enterococcus faecalis	2 (1.1%)
Haemophilus influenzae	2 (1.1%)
Klebsiella spp.	1 (0.6%)
Bacteroides spp.	1 (0.6%)
Escherichia coli	2 (1.1%)
Aggregatibacter actinomycetemcomitans	1 (0.6%)
Actinomyces spp.	2 (1.1%)
Aspergillus spp.	6 (3.4%)
Candida spp.	1 (0.6%)
Postoperative healing	
Uneventful	150 (86%)
Dehiscence and reopening of oroantral fistula	16 (9.2%)
Wound healing disturbance of other kind	8 (4.8%)