



Odontogenic sinusitis – diagnosis and treatment



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Abstract

Introduction: Odontogenic sinusitis is an inflammatory process of the maxillary sinus mucosa etiologically associated with an odontogenic causative agent. The localization of the maxillary sinus predisposes to invasion by pathogenic microorganisms from the nasal and oral cavities. The odontogenic sinusitis differs from the neodontogenic sinusitis in its etiology, microbiology, pathophysiology and therapeutic approach. Accurate determination of the diagnosis and the origin of the lesion is key to developing the correct treatment plan. Nowadays, the combination of a well-done history, an exact clinical examination and a CBCT are used to diagnose odontogenic sinusitis. In terms of treatment approach, specialists rely on a multidisciplinary approach.

AIM: The purpose of this article is to summarize current trends in the diagnosis and treatment of odontogenic sinusitis.

Discussion: The odontogenic sinusitis is an inflammatory process of dental origin whose localization is the maxillary sinus (1). The maxillary sinus is the most vulnerable of all the sinuses to bacterial invasion via the nasal ostium or the mouth cavity because it is located between the oral and nasal cavities (2).

Odontogenic sinusitis is referred to in different literature sources by different names – "odontogenic sinusitis"; "odontogenic maxillary sinusitis", "sinonasal complications of dental disease and treatment". (3).

The odontogenic sinusitis differs from neodontogenic sinusitis in its etiology, microbiology, pathophysiology and treatment approach (2, 4).

Accurately determining the diagnosis and the origin of the lesion are key to developing the correct treatment plan (5). Today, the diagnosis of odontogenic sinusitis is made using a combination of a well-documented history, an exact clinical examination, and an CBCT examination (6).

Treatment won't work if the link between maxillary sinusitis and odontogenic change isn't identified since antibiotics can't get rid of the illness's underlying cause (6). Most of the recent literature on otorhinolaryngologic infections suggests that we should start with treating the source of the odontogenic infection when determining the most effective order in which to perform surgical treatments (5). Some individuals may be able to avoid endoscopic sinus surgery if a timely oral treatment approach is implemented to restore the microecological environment of the sinus (5).

Conclusion: It emerges that odontogenic sinusitis is not at all a rare disease today. This type of sinus infection is most commonly associated with the first and second molars of the maxilla and the tissues surrounding them. The most common oral lesions that cause the development of odontogenic sinusitis are of endodontic and periodontal origin, but cases resulting from iatrogenic sources or surgical interventions do occur. Accurate determination of the diagnosis and the origin of the lesion are key to developing the correct treatment plan. Today, a multidisciplinary treatment approach involving the joint efforts of dentists and otorhinolaryngologist is recommended.

Keywords: Odontogenic sinusitis, maxillary sinusitis, maxillary sinus, odontogenic infection source

INTRODUCTION

The odontogenic sinusitis is an inflammatory process of dental origin whose localization is the maxillary sinus (1). The odontogenic sinusitis differs from neodontogenic sinusitis in its etiology, microbiology, pathophysiology and treatment approach (2, 4).

Accurately determining the diagnosis and the origin of the lesion are key to developing the correct treatment plan (5). Today, the diagnosis of odontogenic sinusitis is made using a combination of a well-documented history, an exact clinical examination, and an CBCT examination (6).

The latest trends recommend a multidisciplinary treatment approach involving the joint efforts of dentists and otolaryngologists (5).

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AIM

The purpose of this article is to summarize current trends in the diagnosis and treatment of odontogenic sinusitis.

MATERIALS AND METHODS

We went through the PubMed and Google Scholar archives to find appropriate studies on the topic. Each paper that is being examined was published between 2005 and 2023. A range of phrases and their combinations were used in the search, including „Odontogenic sinusitis”, „maxillary sinusitis“, „maxillary sinus”, „odontogenic infection source”.

RESULTS AND DISCUSSION

Diagnosis of odontogenic sinusitis

For the correct diagnosis of odontogenic sinusitis, it is necessary for specialists to be very familiar with both the clinical picture of sinusitis and the various odontogenic lesions. In order to make a correct diagnosis, it is necessary to record a detailed history card, the data of which should be analyzed extensively and a thorough examination, both medical and dental, should be performed. Misdiagnosis due to failure to identify the correct etiological cause of the inflammatory process may lead to treatment failure (2, 5, 7, 8).

Essentially, a disparity in the bacterial microecology causes disruption in the sinuses' typical drainage and clearance mechanisms, which results in sinusitis symptoms (5). The primary cause of infection appears to have an impact on the microbiota as well. Different microorganisms are present in odontogenic sinusitis induced by endodontic infections than in odontogenic sinusitis originating from advanced periodontal infections (9). In more than 65% of cases of odontogenic sinusitis, mainly anaerobic bacteria have been isolated and a correlation has been described between the microflora in the dental infection and that found in the infected maxillary sinus (10, 11). The odontogenic sinusitis is a multimicrobial infection resulting from 15 aerobes and 25 anaerobes (12).

Those with symptoms of maxillary sinusitis who have had prior odontogenic infection, dentoalve-

olar surgery, periodontal surgery, or who are not responding to standard sinusitis treatment should be evaluated for an odontogenic cause. Usually, a comprehensive clinical and dental examination with the relevant radiographs is necessary for the diagnosis (2, 13).

In the initial stage of odontogenic sinusitis, oral lesions cause inflammation of the sinus mucosa. It is important to note that in the absence of obturation of the maxillary sinus orifice – patients do not demonstrate the characteristic clinical symptomatology of a sinusitis. In these cases, a thickened sinus membrane may be observed on cone-beam computed tomography (CBCT) (14, 15, 16). Sinus mucosal thickening can be managed or even returned to normal by treating the oral lesion, as the severity of the thickening is directly correlated with it (5). In the presence of an inflammatory process, the mucous membrane of the maxillary sinus may thicken up to 15 times (17).

Odontogenic sinusitis resembles the clinical picture of neodontogenic sinusitis, but is most often unilateral (18). The most characteristic symptoms of odontogenic sinusitis are toothache, headache, facial pain and discomfort, tenderness in the maxillary region, nasal pain, nasal discharge and congestion, nasal congestion, and unpleasant odor. In general, the symptoms of odontogenic sinusitis can vary considerably, and sometimes its development is almost asymptomatic, as there is no osteomeatal obstruction and the sinus stay open (2, 18, 19). Symptoms of dental origin can range from severe, sharp to dull pain depending on the etiologic factor (2). Quite often, specialists cannot determine at the time whether the symptoms originate from the maxillary sinus or are the result of an odontogenic origin (2, 9, 20)

Accurate diagnosis-making can also be aided by otolaryngological evaluation utilizing rhinoscopy, nose and sinus endoscopy, aspiration of sinus contents for cytology, and microbiological tests (2).

When making a diagnosis, radiologic imaging is a vital tool. While assessing the interaction between the maxillary teeth and the maxillary sinus, looking for signs of pneumatization and pseudocysts, or identifying displaced teeth, roots, or foreign objects inside the sinus, a panoramic radiological image can be useful (1, 21, 22).



However, the exact localization of the maxillary molar roots in the vast majority of cases cannot be adequately determined by 2D imaging such as orthopantomography or periapical segmental imaging due to their main drawback – image overlap (22, 23, 24).

The diagnosis of odontogenic sinusitis is an extremely complex process and should be based not only on anamnestic and clinical assessment, but also on imaging (9, 25).

CT (computed tomography) and CBCT (cone-beam computed tomography) over the years have proven to be an essential part in the diagnosis of odontogenic sinusitis. The CT scanner is the gold standard in the diagnosis of sinus disease. This is due to the high resolution and the ability to identify hard and soft tissues. The disadvantages of CT-imaging are associated with frequent artifacts in the presence of metallic obturations and constructions (2, 9, 26, 27). Compared to CT, CBCT examination produces fewer artifacts and ensures greater image resolution. CBCT has become established in daily dental practice in recent years due to its range of advantages (22, 23, 28, 29). Essentially, CT offers a thorough image of the alterations in the hard and soft tissues of the sinuses, particularly the bone alterations in the maxillary sinus floor wall. CBCT is mainly concerned with the complexities of the periodontal tissues and the alterations in the dental tissues. (5, 9).

It is very important to differentiate odontogenic sinusitis from chronic rhinosinusitis affecting the sinuses bilaterally. When the radiological examination shows unilateral changes in the maxillary sinus it is most often a local cause of dental origin and requires examination by a dentist (9, 19). Specialists should be able to differentiate odontogenic sinusitis from other common diseases such as mucous cysts, retention cysts, tumor processes, etc. (9).

Treatment of odontogenic sinusitis

In 2023, swabs from patients with odontogenic sinusitis and those from normal sinuses were compared microbiologically using 16S rRNA sequencing (30). It was found that in patients with odontogenic sinusitis the most common representatives were those of *Fusobacterium*, *Porphyromonas* and *Prevotella*, while in normal sinus secretions were

the representatives of *Staphylococcus*, *Corynebacterium* and *Cutibacterium* (30). Numerous investigations have validated the following in relation to the pharmacological therapy of odontogenic sinusitis, which necessitates focusing on particular microorganisms: Both odontogenic and non-odontogenic sinusitis have quite different microbial compositions, with odontogenic sinusitis primarily being an anaerobic illness (2, 11, 31, 32, 33). This is the reason mainly to be used drugs against anaerobic flora - metronidazole and quinolones (5, 25). In 2016, Saibene et al. (34) published a study finding that 70% of the microflora isolated in odontogenic sinusitis was affected by the combination of amoxicillin and clavulanate, while 100% of the same was affected by levofloxacin, teicoplanin and vancomycin. The same study found that 80% of isolated *Staphylococci* spp produced β -lactamase, thus specific antibiotic therapy was required. An efficient course of antibiotics lasting three to four weeks is recommended for the treatment of odontogenic sinusitis, as it targets oral flora pathogens (2). Of course, medication therapy alone is obviously unsuitable for patients with significant microbiological loads of odontogenic sinusitis, necessitating additional surgical treatment (35, 36). Experts concurred in a recently released consent that a multidisciplinary approach was preferable (2, 18, 37). However, most of the current otorhinolaryngologic literature suggests that we should first address the underlying cause of the odontogenic infection when it comes to the best order of surgical operations (2, 5, 19).

Removal of the source of the odontogenic infection (tooth root or implant in the sinus cavity, extraction of a tooth with periodontitis or endo-parotid lesion, endodontic treatment of an infected tooth) is necessary to minimize the risk of recurrence of sinusitis (2). In cases of odontogenic sinusitis, self-administered dental treatment rarely achieves the required effect (18, 38, 39, 40)

Functional endoscopic sinus surgery (FESS) as a methodology was first described in 1985 and then became one of the main microinvasive methods in otolaryngology surgery (41, 42).

Some writers recommend using functional endoscopic sinus surgery to simultaneously drain the maxillary sinus and remove dental infections orally (43, 44, 45). In 2016, Mattos et al. found that 48% of patients with odontogenic sinusitis should

undergo endoscopic sinus surgery to manage clinical symptoms and prevent the risk of complications (46).

In cases where it is necessary to apply procedures such as sinus floor elevation, but pathological changes in the sinus cavity are seen on the CBCT examination, it is necessary for the dentist to consult an otolaryngologist for treatment of the infection (47).

The literature is not in agreement on the topic of how to proceed in the presence of a foreign body in the sinus. However, its surgical removal is necessary in cases where the foreign body results in clinical sinusitis symptomatology (9).

Last but not least, it should be noted that all specialists agree that if no clinical symptomatology of maxillary sinusitis is present it is not necessary to administer any treatment (48).

CONCLUSION

It emerges that odontogenic sinusitis is not at all a rare disease today. This type of sinus infection is most commonly associated with the first and second molars of the maxilla and the tissues surrounding them. The most common oral lesions that cause the development of odontogenic sinusitis are of endodontic and periodontal origin, but cases resulting from iatrogenic sources or surgical interventions do occur. Accurate determination of the diagnosis and the origin of the lesion are key to developing the correct treatment plan. Today, a multidisciplinary treatment approach involving the joint efforts of dentists and otorhinolaryngologist is recommended.

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