

Surgical Endoscopic Treatment of Odontogenic Sinusitis

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Rezumat

Tratamentul chirurgical endoscopic al sinuzitelor odontogene

Introducere: Sinuzita odontogenă este o afecțiune frecventă a sinusului maxilar ce rezultă dintr-o patologie dentară de tip inflamator sau prin migrarea unui corp străin la nivelul cavității sinusale. Am efectuat un studiu clinic retrospectiv ce a urmărit evaluarea din punct de vedere al indicațiilor, al eficacității și al posibilelor complicații, a două metode chirurgicale endoscopice utilizate în tratamentul sinuzitei maxilare odontogene – antrostomia mijlocie și meatotomia inferioară.

Materiale și Metode: Studiul s-a desfășurat pe o perioadă de cinci ani, din Ianuarie 2019 până în Decembrie 2023, incluzând un număr de 400 pacienți diagnosticați cu sinuzită maxilară odontogenă. Aceștia au avut peste 18 ani și au fost împărțiți în două grupuri astfel: un grup de pacienți tratați prin antrostomie mijlocie și un grup de pacienți tratați prin meatotomie inferioară.

Rezultate: Am examinat fișele medicale ale celor 400 de pacienți. Marea majoritate a acestora au prezentat un istoric de intervenții dentare, iar cel mai afectat dinte a fost primul molar. Simptomele la internare au fost caracteristice sinuzitei: obstrucție nazală, rinoree anterioară sau posterioară, hiposmie până la anosmie, cacosmie și durere sau presiune facială. Din totalul pacienților, 80% dintre aceștia au fost tratați prin antrostomie mijlocie, în timp ce 20% au fost tratați prin meatotomie inferioară. Din punct de vedere al eficacității, complicațiilor, recuperării sau recidivelor, între cele două abordări chirurgicale nu au existat diferențe semnificative. Complicațiile apărute în urma tratamentului chirurgical au fost minore și relativ rare. Cele mai frecvente au fost sinechiile meatului mijlociu și persistența ostiumului de meatotomie, cu apariția fenomenului de recirculare a mucusului (la pacienții cu meatotomie inferioară).

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Concluzii: Tratamentul chirurgical endoscopic al sinuzitei maxilare odontogene se poate face prin antrostomie mijlocie sau meatotomie inferioară, fiecare având indicații specifice. Antrostomia maxilară este preferată în majoritatea cazurilor, deoarece este o procedură în care ostiumul natural al sinusului este lărgit, menținând astfel calea sa naturală de drenaj. Pe de altă parte, meatotomia inferioară este folosită în cazul corpilor străini sau al chisturilor de retenție localizate la nivelul planșeului sinusal sau în recesurile alveolare/laterale. Aceasta mai poate fi utilizată ca parte a unui abord mixt (meatotomie inferioară și mijlocie), când este necesară ablația unui „fungus ball”.

Cuvinte cheie: sinuzita odontogenă, antrostomie mijlocie, meatotomie inferioară, chirurgia endoscopică funcțională sinusală

Abstract

Introduction: Odontogenic sinusitis is a frequent disease of the maxillary sinus, resulting from a dental inflammatory condition or a foreign body migrated in the sinus cavity. We performed a clinical retrospective study aimed to review the two surgical endoscopic approaches for odontogenic maxillary sinusitis – middle and inferior meatotomy, in terms of realistic indications, efficacy, outcomes, and possible complications.

Materials and Methods: In our study, we included a number of 400 patients with odontogenic maxillary sinusitis divided into two groups, treated in our hospital over five years, from January 2019 to December 2023. The patients included in this research were over 18 years old, diagnosed with odontogenic maxillary sinusitis, and underwent either middle meatal antrostomy or inferior meatotomy.

Results: We examined the medical records of 400 patients. The vast majority of patients had a history of dental interventions, and the most affected tooth was the first maxillary molar. The symptoms at admission were typical for sinusitis: nasal obstruction, anterior or posterior rhinorrhea, hyposmia to anosmia, cacosmia, and pain or facial pressure. 80% of the patients in the study underwent middle meatal antrostomy, while 20% underwent inferior meatotomy. There were no significant differences between these two approaches in terms of efficacy, complication rates, recovery, or relapses. The complications that occurred after the surgical treatment were minor and with a very low frequency. The most reported were middle meatus synechiae and the persistence of the meatotomy ostium, with mucus recirculation (in patients with inferior meatotomy).

Conclusions: Endoscopic surgical treatment of odontogenic maxillary sinusitis can be done as middle or inferior meatotomy, each having specific indications. The maxillary antrostomy is preferred in the majority of cases, as it is a procedure in which the natural ostium of the maxillary sinus is enlarged, thereby maintaining the natural drainage pathway of the sinus. However, the inferior meatotomy is preferred in the case of foreign bodies or maxillary sinus retention cysts localized at the level of the sinus floor or in the alveolar or lateral recesses, or as part of a combined approach (inferior and middle meatotomy), when the ablation of a "fungus ball" is required.

Key words: odontogenic sinusitis, middle meatotomy, inferior meatotomy, functional endoscopic sinus surgery

Introduction

Sinusitis is a very common disease worldwide, with a prevalence rate of 14% in the USA(1,2).

As the name suggests, it is characterized by an inflammation of the mucosa of the paranasal sinuses. The term odontogenic sinusitis (ODS), describes an infection of the maxillary

sinus that results from dental procedures or nearby infectious dental disease (3). ODS is thought to be the cause of 25-40% of cases of chronic maxillary sinusitis, which is most often unilateral (4).

The initial course of treatment is medical therapy, which consists of nasal irrigation and a minimum of two cycles of oral antibiotics (usually penicillin, cephalosporins, or fluoroquinolones) (2,5,6). If medical therapy fails to cure sinusitis surgery is mandatory to eliminate the origin of the pathology and enable proper sinus drainage and ventilation. Depending on the etiology and the state of the maxillary sinus floor, this involves either an oral approach via canine fossae or functional endoscopic sinus surgery (FESS) (7).

This clinical retrospective study aims to report the experience of our department of Otorhinolaryngology (Sfânta Maria Hospital, Bucharest, Romania) in treating odontogenic maxillary sinusitis and point out the two types of surgical endoscopic approaches – middle meatotomy vs. inferior meatotomy.

Materials and Methods

Clinical data from patients who received surgical endoscopic treatment for odontogenic maxillary sinusitis during a period of 5 years, between January 2019 and December 2023, in the Otorhinolaryngology department of the Sfânta Maria Hospital in Bucharest, Romania, were taken into consideration. Analysis of the patient's medical records was conducted based on characteristics such as sex, age, origin, comorbidities, symptoms, affected tooth, history of dental procedures, surgical endoscopic treatment, presence of dental material in the maxillary sinus, the duration of hospitalization, and postoperative complications.

When reviewing the clinical cases, the following inclusion criteria were used:

1. patients over 18 years old;
2. clinical diagnosis of sinusitis with an odontogenic etiology, based on imagistic (computer tomography) and endoscopic evidence;
3. patients with odontogenic sinusitis with

surgical endoscopic treatment;

4. preoperative detailed computer tomography (CT) examination.

The exclusion criteria were:

1. patients under 18 years old;
2. pregnant women;
3. patients who did not consent to surgical treatment;
4. patients with contraindications for general anesthesia.

400 of the patients treated in our clinic conformed to the criteria and were included in the study. The clinical presentation of odontogenic sinusitis may vary in many ways, but the most typical symptoms were facial pain or pressure, nasal congestion, postnasal drip, purulent anterior/posterior rhinorrhea (usually uni-lateral), and cacosmia. It is essential to get a complete medical history, especially when the patient is referred for dentoalveolar surgery (8). A key aspect of the initial physical examination is a thorough assessment of the dentition for root fractures, the existence of an oral-antral fistula, and the state of any current dental restorations.

In the initial ENT examination, an oral exam was conducted to detect oral or dental lesions, a flexible endoscope was used to explore the nasal cavity and the sinuses, and a maxillofacial CT scan was analyzed to confirm the diagnosis. The CT scans showed either a foreign body in the maxillary sinus cavity, or just mucosal thickening and inflammation (see *Figs.1, 2*).

Functional endoscopic sinus surgery (FESS) was performed, using rigid 0°, 30°, 45°, and 70° endoscopes, with the patient under general anesthesia (see *Figs. 3, 4*). In order to minimize intraoperative bleeding and mucosal congestion, nasal decongestion using cottonoids soaked in a 1:1,000,000 lidocaine and adrenaline solution was applied 15 minutes before the surgical intervention. Also, any important anatomical variation (deviated nasal septum, polyps in the middle meatus, etc.) that obstructed the view of the surgical field, did not allow the handling of instruments inside the nasal cavity or that led to decreased drainage, was surgically resolved.

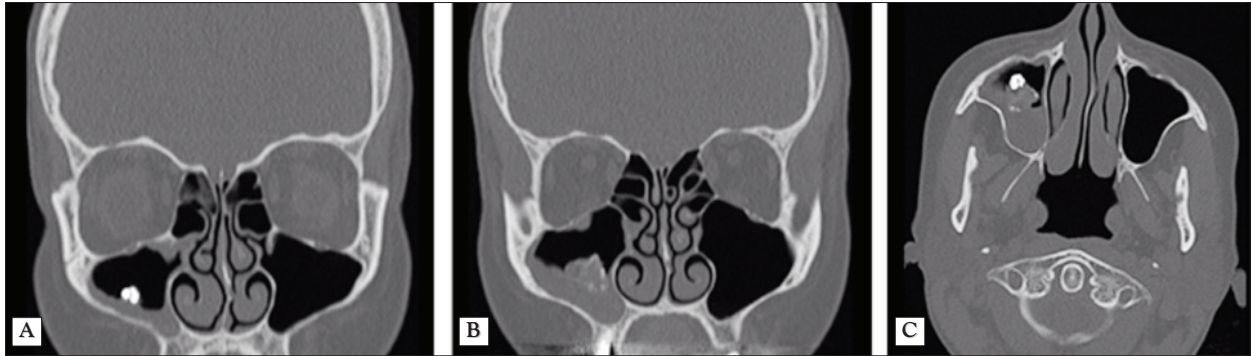


Figure 1. Paranasal sinus CT scan coronal (A, B) and axial view (C) showing a metallic foreign body at the floor of the right maxillary sinus, with adjacent mucosal thickening and inflammation, most likely post dental procedure



Figure 2. Paranasal sinus CT scan axial (A), coronal (B) and sagittal view (C) showing a metallic foreign body at the floor of the left maxillary sinus, with adjacent mucosal thickening and inflammation, most likely post dental instrumentation

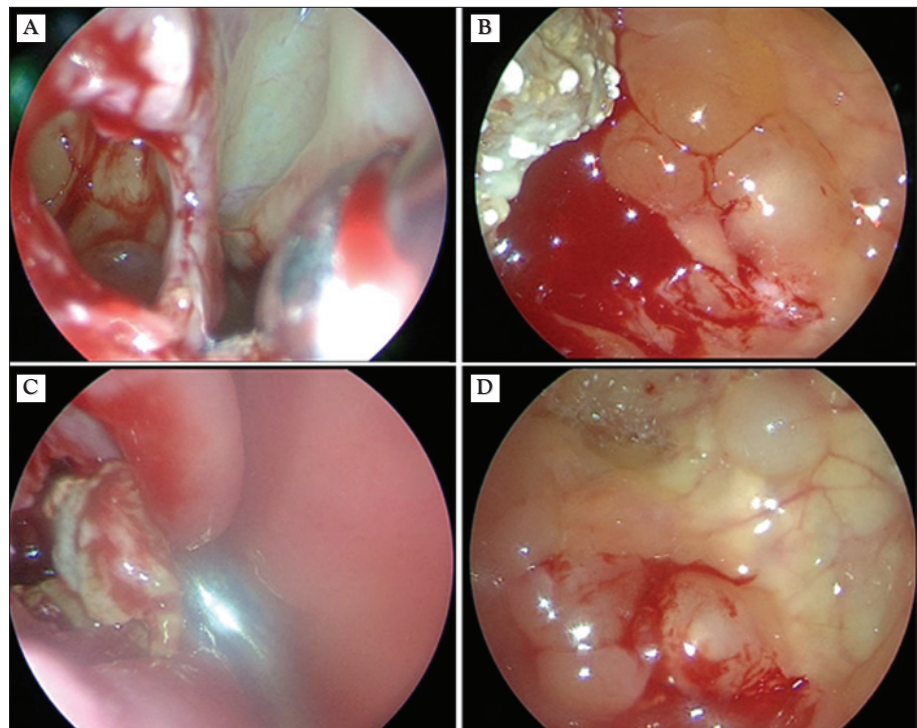
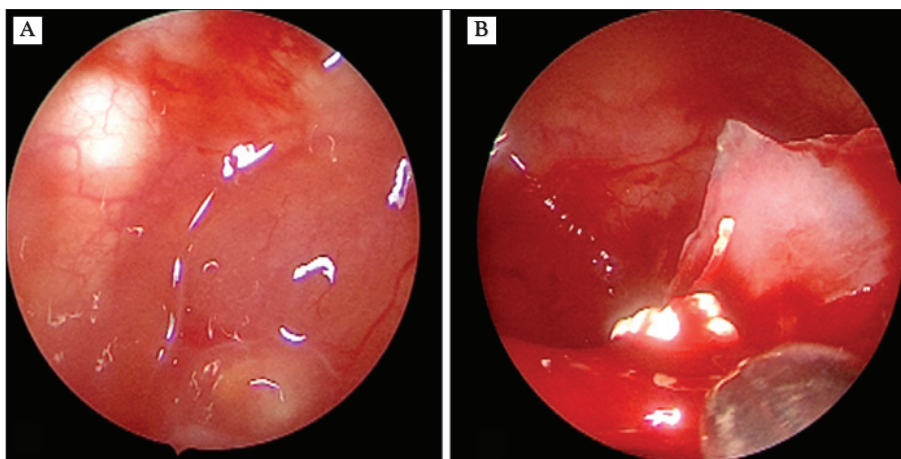


Figure 3. Middle meatotomy in a patient with odontogenic sinusitis. (A) The antrostomy hole. (B) The maxillary sinus cavity - polypoid transformation of the mucosa and grey, fungal material. (C) Ablation of the polyps and fungal material from the sinus cavity. (D) Postoperative aspect of the sinus cavity

Figure 4. Inferior meatotomy in a patient with odontogenic sinusitis. **(A)** The maxillary sinus cavity - mucosal thickening and inflammation. **(B)** Dental material inside the maxillary sinus



The surgical technique for performing an antrostomy involves removing of the inferior part or the entire uncinate process, with the exposure of the natural drainage orifice of the maxillary sinus, followed by the widening the natural ostium using a cutting tool, bite forceps or microdebrider. It is important to mention that the ostium is enlarged posterior and inferior to avoid the lesion of the orbit in the upper part and the nasolacrimal duct. The last step is the sinus lavage and aspiration of secretions, removal of the foreign bodies, cysts, polyps, or hyperplastic mucosa, depending on the underlying disease (9). Another important aspect worth mentioning is that in the case of an accessory ostium, it must be connected with the natural one to avoid the phenomenon of mucus recirculation. This is the election procedure in the treatment of odontogenic sinusitis, as it preserves the natural drainage pathway (9-11).

On the other hand, the inferior meatotomy consists in creating a window in the inferior meatus. This window closes spontaneously in variable periods in most cases. Otherwise, there is a risk of persistence of the meatotomy orifice that can lead to mucus recirculation between the natural ostium of the maxillary sinus and the new inferior meatotomy ostium. This procedure is of second choice and has limited indications, being reserved for the extraction of foreign bodies or maxillary sinus retention cysts, localized at the level of the sinus floor or in the alveolar or lateral recesses

(areas more difficult to access through middle meatotomy), respectively as part of a combined approach (inferior and middle meatotomy) for the ablation of a maxillary “fungus ball” (9,12,13).

Patients were hospitalized for 24-48 hours, with a few exceptional cases who presented multiple comorbidities and, at the request of the anesthesiologist, required additional specialist consultations (cardiology, diabetology, internal medicine), thus prolonging the duration of hospitalization. There was no significant difference between the two surgical approaches in terms of hospitalization period. The patients received perioperative antibiotic prophylaxis, and in the case of suppurations or positive bacterial cultures, the antibiotic treatment was extended up to 7 days postoperative. Our choice of antibiotic was a combination of Amoxicillin and Clavulanic Acid or Cephalosporins with Metronidazole. In addition to the antibiotic regimen, we also prescribed steroidal anti-inflammatory drugs and analgesics. After discharge from the hospital, we recommended Amoxicillin/Clavulanic Acid twice daily, 1-week, nasal lavage with 0.9% Na solutions at least three times per day and nasal decongestant sprays twice per day, if the mucosal congestion persists, but no more than 5 consecutive days.

Results

In our study, from the total of 400 patients,

190 were male and 210 were female. 75% came from the urban areas of the country, while 15% came from the rural. As for the age distribution, we noticed that most of the patients were middle-aged, with a general mean age of 45,37 (the youngest patient was 24 years old and the oldest 78 years old) (see *Fig. 5*).

The patients presented themselves or were referred by the dentists with a wide variety of symptoms, ranging from nasal obstruction, anterior or posterior rhinorrhea, hyposmia/anosmia, and cacosmia, to a feeling of pain or facial pressure (see *Fig. 6*).

Most of the patients had periapical abscesses and periodontal abscesses, accounting for 82.50%

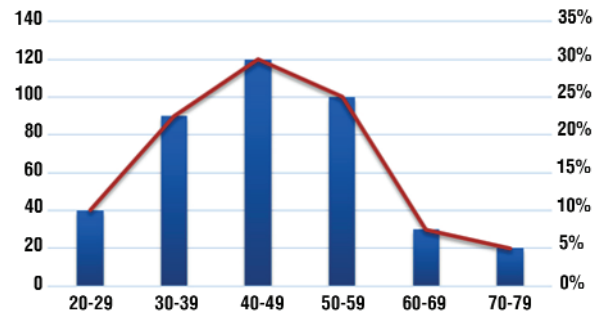
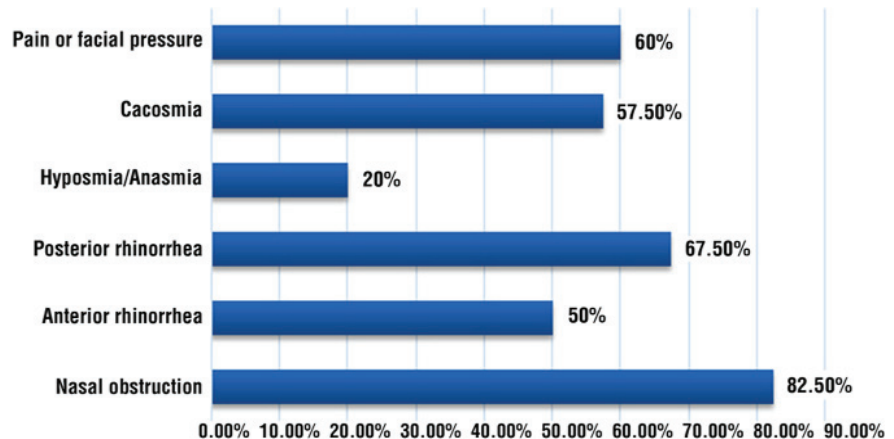


Figure 5. Age distribution

(330 patients) of the cases according to their dental and radiologic examinations. Intra-sinusal foreign bodies were discovered in

Figure 6. Symptoms of the patients



17.5% of cases (70 patients) (*Fig. 7*).

Regarding the tooth that caused the sinus disease, the molars were typically the primary source of the pathology. We discovered that molars accounted for 79.26% of cases (31.94% the first molar, 25.83% the second molar, 21.49% the third molar), with premolars accounting for 11.39% of cases and wisdom teeth for 9.35% of cases (see *Fig. 8*).

After a thorough history, routine laboratory investigations, a general ENT examination, and a nasal endoscopy, the patients underwent a CT sinus scan. Every scan was performed using sagittal reconstruction and 3 mm thickness in the axial and coronal planes. The CT

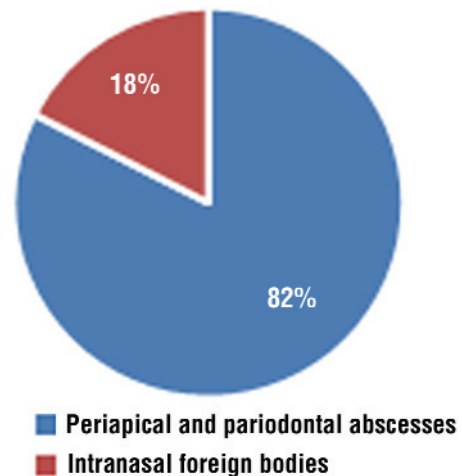


Figure 7. Dental pathology associated with ODS

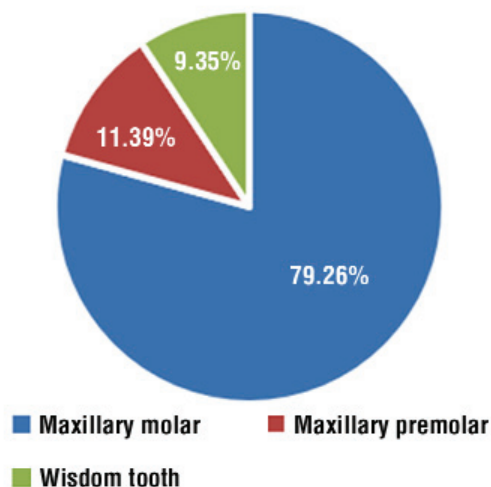


Figure 8. Teeth involvement in ODS

results for the patients included in the study with odontogenic rhinosinusitis were significant because they demonstrated the disease's severity, ranging from a minor mucosal layer thickening to the opacification of several sinuses.

As far as functional endoscopic sinus surgery is concerned, there were two aspects that needed to be taken into consideration: if the patient had a deviated septum, hindering the handling of the endoscope rod, and if the patient had nasal polyps with the origin in the middle meatus. 75% of the patients had a nasal septal deviation, and 30% of them needed septoplasty before the maxillary sinus was addressed. Also, 22,5% presented with polyps in the middle meatus which had to be removed before the intervention on the maxillary sinus (see *Fig. 9*).

The surgical treatment in the case of odontogenic sinusitis consists basically of three main techniques: two endoscopic procedures – antrostomy and inferior meatotomy and one external approach – Caldwell-Luc operation. In this study, we took into consideration only the endoscopic approaches. Thus, 80% of the patients in this study underwent antrostomy, while the remaining 20% were treated with inferior meatotomy. The antrostomy is preferred in most of the cases, as it is a procedure in which the natural ostium of the maxillary

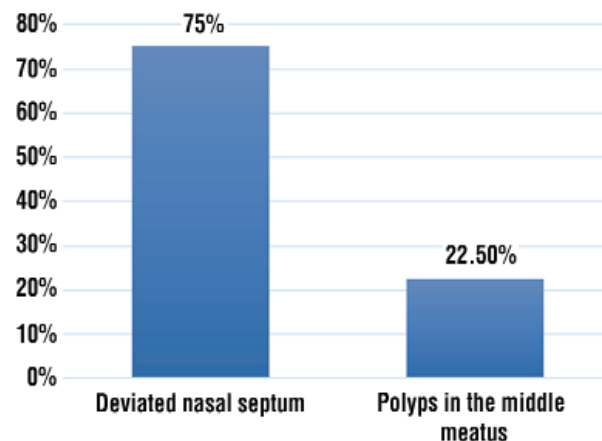


Figure 9. Presence of a deviated nasal septum or polyps in the middle meatus in the study group

sinus is enlarged, thereby maintaining the natural drainage pathway of the sinus.

All the patients had a complete resolution of the symptoms at the 10, 30- and 90-day follow-up, with the disappearance of the clinical and endoscopic signs of sinusitis.

The postoperative complications depended on the surgical endoscopic approach. The patients were followed up at 2 weeks, one month, 3 months, and 6 months. The main complication that occurred in the middle meatotomy group was the appearance of a synechiae at the level of the middle nasal meatus, while in the inferior meatotomy group the main complication was the persistence of the meatotomy orifice, with recirculation of secretions from the maxillary sinus (*Fig. 10*). No complications related to the nasolacrimal duct were encountered.

Statistical Analysis

For the statistical analysis, the R program, version 4.2.3 Copyright (C) 2023 The R Foundation for Statistical Computing, R Core Team (2023). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org>

Analysis of the influence of demographic, clinical, and paraclinical variables on the dura-

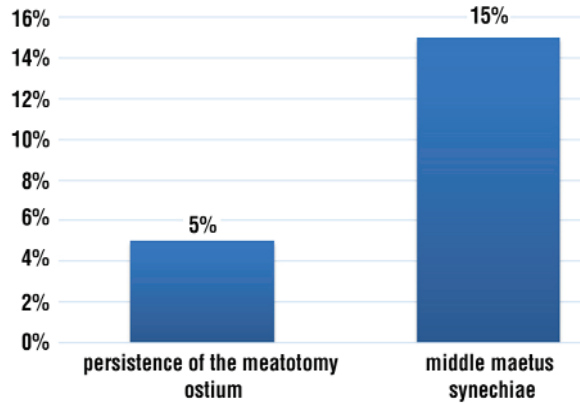


Figure 10. Postoperative complications inferior meatotomy vs middle meatus synechiae

tion of hospitalization of patients - a simple univariate linear regression was used, the dependent variable was the number of days of hospitalization, while the independent variables were the other variables monitored in the study. The level of significance α was 0.05, so p-values lower than 0.05 were considered statistically significant (Table 1).

The only parameters that showed a p value <0.05 were the presence of atrial fibrillation and hypertension, these factors being the only two that were statistically significant.

Discussion

Chronic rhinosinusitis (CRS) is a prevalent medical condition that has a major influence on overall health and is associated with high medical expenses (1). The term "ODS", or odontogenic sinusitis, describes an infection of the maxillary sinus that results from dental procedures or nearby infectious dental disease (3). ODS is thought to be the cause of 25-40% of cases of chronic maxillary sinusitis, which is usually unilateral (4). Despite being frequently disregarded by otolaryngologists, dentists, and radiologists as a cause of sinonasal disease, OS deserves special attention due to its distinct microbiology, pathophysiology, and therapy in contrast to "rhinogenic"

Table 1. Statistical analysis showing the influence of demographic, clinical and paraclinical variables on the duration of hospitalization

Predictor	N	Beta (95% CI) ¹	p-value
Age	400	0.05 (0.02 to 0.08)	<0.001
Sex			
B	190	—	
F	210	0.27 (-0.53 to 1.1)	0.513
Origin			
Rural	100	—	
Urban	300	-0.40 (-1.3 to 0.52)	0.401
Affected tooth			
Molar	360		
First molar	115		
Second molar	93		
Third molar	79		—
Premolar	40	-0.33 (-1.7 to 1.0)	0.629
Affected side			
Right	250	—	
Left	150	0.16 (-0.67 to 0.99)	0.708
Dental procedures			
No	70	—	
Yes	330	0.36 (-0.69 to 1.4)	0.504
Nasal septal deviation			
No	100	—	
Yes	300	-0.40 (-1.3 to 0.52)	0.401
Polyps in the middle meatus			
No	310	—	
Yes	90	0.33 (-0.63 to 1.3)	0.505
Postoperative complications			
No	320	—	
Yes	80	-0.69 (-1.7 to 0.30)	0.179
Dental pathology (intrasinus material)			
No	330	-0.21 (-1.1 to 0.69)	0.645
Yes	70	—	
Nasal obstruction			
No	70	—	
Yes	330	0.02 (-1.0 to 1.1)	0.975
Anterior rhinorrhea			
No	200	—	
Yes	200	0.00 (-0.81 to 0.81)	0.999
Posterior rhinorrhea			
No	130	—	
Yes	270	-0.13 (-0.99 to 0.74)	0.777
Cacosmia			
No	170	—	
Yes	230	-0.30 (-1.1 to 0.51)	0.478
Pain or facial pressure			
No	160	—	
Yes	240	-0.75 (-1.5 to 0.04)	0.070
Obesity			
No	220	—	
Yes	180	-0.34 (-1.1 to 0.46)	0.407
Hypertension			
No	240	—	
Yes	160	0.96 (0.19 to 1.7)	0.019
Diabetes mellitus			
No	310	—	
Yes	90	0.33 (-0.63 to 1.3)	0.505
Atrial fibrillation			
No	360	—	
Yes	40	1.9 (0.69 to 3.1)	0.004
Type of surgery			
Inferior meatotomy	80	—	
Middle meatus	320	-0.88 (-1.8 to 0.09)	0.085

¹ CI = Confidence Interval

sinonasal disease (14). Recently, the incidence of odontogenic sinusitis has been escalating due to the increasing number of dental procedures such as canal treatments, dental implants, and lifting sinus procedures.

Despite being initially described about a century ago, OS is still a disorder that is underdiagnosed and undervalued. The most frequent cause of ODS is iatrogenic damage to the maxillary sinus's mucoperiosteum, also known as the Schneiderian membrane (15). Odontogenic sinusitis has been linked to dental procedures such as extractions, maxillary dental implants, sinus augmentation grafts (also known as "sinus lifts"), misplaced foreign bodies, and orthognathic and cleft surgical surgeries (16). Additional possible causes are periodontal and periapical disorders. Dental cavities sometimes spread into the dental pulp, causing pulpitis and apical infection, which is the usual cause of endodontic infections. The end result is inflammation and/or disruption of the Schneiderian membrane, which, in turn, causes mucosal inflammation and modified mucociliary function within the maxillary sinus (17). A compromised mucociliary barrier leads to altered mucus transport, compromised mucosal defenses, obstruction of the sinus ostia, and subsequent inflammation and bacterial infection (18).

In the diagnosis of odontogenic sinusitis, a thorough history of the disease plays an essential role, especially regarding dental procedures on the upper dental arch. However, some patients don't mention a recent dental procedure. This is probably because implant-associated maxillary sinusitis has a nearly four-year latency period, while augmentative dental surgery-associated maxillary sinusitis can have a one-year latency (16).

Troeltzsch et al conducted a study on 174 cases followed over a period of 8 years. Regarding the etiology of odontogenic sinusitis, dentoalveolar surgery with subsequent oroantral fistula formation was the main cause of odontogenic sinusitis, followed by periapical and periodontal pathology (16).

In a 2014 systematic review in which Lechien et al studied the etiology of 674 cases of odontogenic sinusitis, they reported that 65.7% of cases had an iatrogenic etiology, 25.1% had apical periodontal disease, and 8.3% had marginal periodontitis (17). Moreover, Chemli et al showed in a study on 22 patients that periapical infection, foreign bodies, cysts, and oroantral communication were the main causes of odontogenic sinusitis (19). Our study confirms what the literature says in terms of dental pathology that caused the sinusitis. Thus, periapical and periodontal abscesses accounted for 85% of the cases, while intrasinus foreign bodies were found in 15% of cases according to the dental and radiologic examinations of the patients.

The 2014 systematic review by Lechien et al also showed that the first molar (35.6%), second molar (22%), third molar (17.4%), and second premolar (14.4%) were the most frequently afflicted maxillary teeth (16). Our study showed similar results. Among patients with odontogenic sinusitis, molars were the most affected (31,94% the first molar, 25,83% the second molar, and 21,49% the third molar), followed by the maxillary premolars in 11,39% of cases and the wisdom teeth in 9,35% of cases.

Clinically, patients with odontogenic sinusitis have nasal obstruction, anterior or posterior rhinorrhea, hyposmia or anosmia, and pain or facial pressure (20). In our study, we encountered the same variety of symptoms. The predominant symptom in the study group was nasal obstruction, followed by rhinorrhea and pain or facial pressure. Cacosmia appears mostly in the case of fungal or anaerobic infection.

For the accurate diagnosis of odontogenic sinusitis, a complete and correct assessment of the patient is needed. The evaluation must begin with the detailed history of each patient together with the clinical and ENT examination. Further investigations include the nasal endoscopy to assess the edema of nasal mucosa as well as the presence of purulent secretions and polyps, as in the Lund-Kennedy Endoscopic Scoring system. This

score is composed of five terms, each ranked from 0 to 2, one for each side: polyposis, discharge, edema, scarring, and crusting. Greater scores denote a worse state of the observed illness (21). We found that a percentage of 22.5% of the patients had polyps with discharge in the middle meatus, while 75% of them had a deviated nasal septum.

Computed tomography is the most important investigation of rhinosinusal disorders, representing the gold standard for the diagnosis of odontogenic sinusitis. It is a fast and easily accessible imaging method, very well tolerated by most patients, especially those in critical condition or those suffering from claustrophobia. Acquisition of CT images is mandatory in preoperative preparation, as it shows anatomical landmarks, anatomical variations, and the extension of the disease. It can also suggest the etiology of the condition through different tissue densities. Usually, it is not necessary to administer intravenous contrast, unless we suspect a tumor or a vascular injury. (22). All patients in the study had a CT scan of the paranasal sinuses that revealed various stages of maxillary sinus involvement. These ranged from thickening and inflammation of the mucosa to complete opacification of the sinuses. Also, some images showed the presence of intrasinusal foreign bodies. Every scan was performed using sagittal reconstruction and 3 mm thickness in the axial and coronal planes.

Odontogenic sinusitis is not characterized by specific signs and symptoms, and if left untreated, it can cause major problems, including extension to the orbital cavities and/or cranial structures (3). The treatment is different from that used for maxillary sinusitis with rhinological etiology and often requires a multidisciplinary approach that includes the ENT specialist and a maxillofacial surgeon. (23,24).

The first line of treatment is medical therapy, which includes nasal irrigation and two series of oral antibiotics (flucoroquinolones and cephalosporins however, reports also include cephalosporins) (2,5,6). When treating odontogenic sinusitis, antibiotics should be used for at least

14 days, or at least 7 days following the symptomatic remission (25). It is also important to eliminate the oral infection, to avoid the persistence of symptoms. While waiting for surgical intervention, medical therapy is necessary to manage symptoms. Some small-scale investigations conducted by Lee et al, Craig et al and Kim et al reported that after two or three cycles, an OS remission is documented in 15-20% of cases (26-28). When medical therapy fails to treat the disease, surgery is required to remove the cause. Through surgical treatment, adequate drainage and ventilation of the sinuses will be obtained, and the recurrence of the disease will be prevented. Depending on the dental pathology that led to the onset of sinusitis, but also on the condition of the sinus floor, surgical treatment involves either an oral approach or a functional endoscopic sinus surgery (FESS) (7).

If left untreated, odontogenic sinusitis can progress and involve the nasal cavity, ethmoid, and frontal sinuses. In severe cases, orbital and intracranial infectious-inflammatory complications may occur. Among these complications are orbital cellulitis, meningitis, subdural empyema, brain abscess, cavernous abscess, and sinus thrombosis (9). Complications can also occur postoperatively. In our study group, we selected only patients with isolated maxillary odontogenic sinusitis. Thus, the two main postoperative complications were the persistence of the meatotomy hole in the case of the lower meatotomy and the appearance of synechiae at the level of the middle nasal meatus, in the case of the antrostomy.

Conclusions

Odontogenic sinusitis is a pathological entity that seems to be more and more widespread in the general population. It is important to recognize its etiology and treat it promptly, in order to avoid the progression of the disease. The first line of treatment is medical treatment with antibiotics and nasal irrigation. However, the source of the sinus infection must be cleared. Thus, depending on the oral etiology and the status of the floor of the maxi-

llary sinus, an oral approach or an endoscopic approach is chosen. The endoscopic approach is represented by middle and inferior meatotomy, with specific applications. The middle meatotomy is the procedure of election as it preserves the natural drainage pathway of the sinus. The inferior meatotomy is of choice in isolated cases such as the extraction of foreign bodies or maxillary sinus retention cysts, localized at the level of the sinus floor or in the alveolar or lateral recesses, respectively as part of a combined approach (inferior and middle meatotomy) for the ablation of a maxillary "fungus ball". It is rarely indicated, as there is the risk of an aberrant mucus recirculation between the natural ostium of the maxillary sinus and the new inferior meatotomy ostium, should it not close spontaneously.

Considering the increase in patients' access to dental services as well as the large spread of dental surgical techniques (canal fillings, implants, bone augmentations), the number of cases of sinusitis with a dental starting point is constantly increasing.

Conflicts of Interest and Source of Funding

The authors state no conflict of interest or sources of funding.

Ethical Approval

The research related to human use complies with all the relevant national regulations and institutional policies, is in accordance with the tenets of the Helsinki Declaration, and has been approved by the review board of Sfanta Maria Clinical Hospital, Bucharest, Romania.

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