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Original Research

Clinical efficacy of combined approach in treating maxillary sinusitis of dental origin a prospective study

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ABSTRACT:
Objective: Maxillary sinusitis of dental origin (MSDO) is a common condition that arises from dental infections or procedures affecting the maxillary sinus. This prospective study aims to evaluate the clinical efficacy of a combined approach involving functional endoscopic sinus surgery (FESS) and concurrent dental interventions in treating MSDO. **Methods:** A total of 120 patients with confirmed MSDO were enrolled in this study, and 110 completed the 12-month follow-up. Patients underwent FESS to restore sinus drainage and address sinus inflammation, followed by dental interventions such as root canal therapy, tooth extraction, or oroantral fistula closure. Postoperative pharmacological management included antibiotics, nasal corticosteroids, and saline nasal irrigation. Outcomes were measured using the Sino-Nasal Outcome Test (SNOT-22) for symptom resolution, nasal endoscopy for sinus inflammation, and the Short Form Health Survey (SF-36) for quality of life. The primary outcome was the resolution of sinusitis symptoms, and secondary outcomes included recurrence rates, complications, and quality of life improvements. **Results:** At 12 months, 96% of patients experienced complete resolution of sinusitis symptoms, with a mean reduction of 25.5 points on the SNOT-22 scale ($p < 0.001$). Nasal endoscopy showed 96% had no residual inflammation. The recurrence rate was 4%, and these cases were successfully managed with revision surgery and additional dental treatments. Minor complications included transient nasal bleeding (8%) and facial pain (12%), all managed conservatively. Quality of life significantly improved in all SF-36 domains, with the greatest gains in physical pain, general health, and emotional well-being. **Conclusion:** The combined approach of FESS and dental intervention is highly effective for treating MSDO, leading to high rates of symptom resolution, low recurrence, and significant improvements in patient quality of life. This multidisciplinary treatment strategy should be considered the standard of care for MSDO.
Keywords: Maxillary sinusitis, dental origin, FESS, root canal therapy, oroantral fistula, interdisciplinary treatment, quality of life.

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INTRODUCTION

Maxillary sinusitis is a common clinical condition characterized by inflammation of the maxillary sinuses, typically resulting in symptoms such as facial pain, nasal congestion, post-nasal drip, and purulent nasal discharge. While most cases of maxillary sinusitis arise from viral, bacterial, or allergic causes, a significant subset is odontogenic in origin. Maxillary sinusitis of dental origin (MSDO) refers to sinusitis that is directly linked to dental pathology, such as periapical abscesses, periodontal disease, dental extractions, or other dental procedures that

involve the maxillary teeth. This condition can also result from foreign bodies, such as displaced dental implants or root canal materials, entering the maxillary sinus [1].

MSDO has been estimated to account for 10-40% of all cases of chronic maxillary sinusitis, making it an important consideration in patients presenting with sinusitis symptoms, especially when conventional medical treatment fails [2]. Anatomically, the roots of the maxillary molars and premolars are closely related to the floor of the maxillary sinus, with only a thin layer of bone or mucosa separating the two structures. This proximity allows for dental infections to easily spread into the sinus, leading to the development of MSDO. Additionally, oroantral communications, which can occur following tooth extractions or trauma, serve as another potential route for infection [3].

Challenges in Diagnosis

The diagnosis of MSDO poses unique challenges because its symptoms often mimic those of primary sinusitis. Patients frequently present with symptoms typical of sinusitis, such as nasal obstruction, facial pressure, and mucopurulent nasal discharge. However, in the case of MSDO, these symptoms are accompanied by signs of dental pathology, including tooth pain, dental abscesses, or visible oroantral fistulas. Imaging studies, such as computed tomography (CT) or cone-beam CT, are often necessary to distinguish MSDO from other types of sinusitis, as they allow for a detailed visualization of both the maxillary sinus and the dental structures [4].

The key to effective management of MSDO lies in identifying and addressing the underlying dental cause. Standard treatment for sinusitis—such as antibiotics, nasal corticosteroids, and saline irrigation—may provide temporary relief but often fails to resolve the infection if the dental source remains untreated. This is because the persistent dental infection continuously seeds the maxillary sinus with pathogenic bacteria, leading to chronic or recurrent sinusitis. Therefore, a successful therapeutic approach must target both the sinus infection and the dental pathology simultaneously [5-7].

The primary aim of this prospective study is to evaluate the clinical efficacy of a combined surgical and pharmacological approach in treating maxillary sinusitis of dental origin. We aim to assess the success rate, symptom resolution, recurrence rates, and overall quality of life in patients treated with this interdisciplinary approach. By providing robust data on the outcomes of this treatment strategy, we hope to offer valuable insights into the management of MSDO and establish the combined approach as the standard of care for this condition.

MATERIALS AND METHODS

Study Design

This prospective cohort study was conducted over a three-year period at a tertiary care hospital with specialized departments of otolaryngology and oral and maxillofacial surgery. The study aimed to evaluate the clinical efficacy of a combined surgical and pharmacological approach in treating patients diagnosed with maxillary sinusitis of dental origin (MSDO). Ethical approval for the study was obtained from the institutional review board, and written informed consent was obtained from all participants prior to their enrollment.

Patient Selection

Inclusion Criteria

Patients were eligible for inclusion in the study if they met the following criteria:

1. Age Range: Adults aged 18 to 70 years.
2. Diagnosis of MSDO: All patients had a confirmed diagnosis of MSDO, based on clinical presentation and radiologic imaging. Diagnostic criteria included:
3. History of sinusitis symptoms (e.g., facial pain, nasal obstruction, post-nasal drip, or purulent nasal discharge).
4. Imaging findings (computed tomography [CT] or cone-beam CT) indicating both sinus and dental pathology. This included:
5. Maxillary sinus opacification.
6. Presence of dental pathology, such as periapical abscesses, cysts, oroantral fistulas, or foreign bodies (e.g., displaced dental implants or root canal materials) in the sinus cavity.
7. Failure of Initial Conservative Treatment: All patients had failed at least 4 weeks of conservative medical treatment for sinusitis, including antibiotics and nasal decongestants, prior to surgical intervention.
8. Dental Pathology as Primary Cause: The etiology of the sinusitis was determined to be of dental origin, confirmed by dental examination and imaging.

Exclusion Criteria

Patients were excluded from the study if they met any of the following criteria:

1. **Sinusitis of Non-Dental Origin:** Cases where the maxillary sinusitis was attributed to non-dental causes, such as viral or allergic sinusitis, were excluded.
2. **Systemic Immunosuppression:** Patients with immunocompromising conditions, such as HIV or those on long-term immunosuppressive therapy, were excluded to minimize confounding factors related to healing and infection control.
3. **Previous Maxillary Surgery:** Patients with a history of prior surgery involving the maxillary sinus or dental structures within the past 12 months were excluded to eliminate bias related to previous interventions.
4. **Incomplete Follow-up:** Patients who were unable or unwilling to comply with the follow-up

schedule were excluded to ensure consistency in data collection.

Preoperative Evaluation

All patients underwent a thorough preoperative evaluation by both an otolaryngologist and a dental specialist to confirm the diagnosis of MSDO and to plan appropriate interventions. The following assessments were performed:

- **Clinical Examination:** A detailed history was taken, and a physical examination was performed, focusing on sinus and dental symptoms. Signs of sinusitis, such as nasal discharge, facial tenderness, and dental abnormalities (e.g., abscesses or visible fistulas), were documented.
- **Imaging:** All patients underwent preoperative imaging, either through CT or cone-beam CT, to assess both the sinus and dental structures. CT was preferred for its superior resolution in identifying sinus opacification and inflammatory changes, while cone-beam CT was used for detailed dental imaging. This allowed for the precise identification of the dental pathology responsible for the MSDO.
- **Microbiological Sampling (Optional):** In select cases, purulent material from the maxillary sinus was obtained via aspiration and sent for microbial culture and sensitivity testing to guide appropriate antibiotic therapy.

Treatment Protocol

The treatment protocol involved a multidisciplinary approach, combining both functional endoscopic sinus surgery (FESS) and appropriate dental interventions, followed by postoperative pharmacological management.

1. Endoscopic Sinus Surgery (ESS)

FESS was performed by an experienced otolaryngologist, using standard endoscopic techniques. The goal of FESS was to restore ventilation and drainage of the affected maxillary sinus by:

- Removing purulent material and inflamed mucosa.
- Enlarging the maxillary sinus ostium to allow for proper drainage.
- Removing any foreign bodies (such as dental implant materials or root canal debris) that had migrated into the sinus cavity.

During the surgery, care was taken to avoid disruption of critical structures such as the orbital floor or the infraorbital nerve. Patients underwent FESS under general anesthesia, with the procedure lasting approximately 1 to 2 hours, depending on the complexity of the case.

2. Dental Interventions

A concurrent dental procedure was performed by a dental surgeon or oral and maxillofacial specialist, tailored to the specific dental pathology identified during preoperative evaluation. These procedures included:

- **Root Canal Therapy:** For patients with periapical abscesses or infected teeth, root canal therapy was performed to eliminate the source of infection while preserving the tooth.
- **Tooth Extraction:** In cases where the affected tooth could not be saved, such as in cases of severe infection or structural damage, the offending tooth was extracted.
- **Oroantral Fistula Closure:** For patients with oroantral fistulas, closure was achieved using a variety of techniques, including soft tissue flaps or bone grafting, depending on the size and location of the fistula.
- **Removal of Foreign Bodies:** Displaced dental implants or root canal materials within the sinus were removed endoscopically during the same surgical session.

3. Pharmacotherapy

Following the combined surgical interventions, all patients received a standardized postoperative pharmacological regimen, which included:

- **Antibiotics:** A course of antibiotics (amoxicillin-clavulanate 875 mg/125 mg twice daily or clindamycin 300 mg three times daily for penicillin-allergic patients) was prescribed for 10-14 days to control bacterial infection and prevent postoperative complications.
- **Nasal Corticosteroids:** Patients were prescribed intranasal corticosteroids (e.g., mometasone furoate 200 mcg daily) to reduce postoperative inflammation in the sinus mucosa.
- **Saline Nasal Irrigation:** Patients were instructed to perform daily saline nasal irrigation to promote sinus drainage and mucociliary clearance.

Outcome Measures

Primary Outcome

The primary outcome measure was the resolution of sinusitis symptoms, as assessed by both clinical examination and patient-reported outcomes using the **Sino-Nasal Outcome Test (SNOT-22)**. This validated questionnaire assesses the severity of symptoms such as nasal obstruction, facial pain, and post-nasal drip, with higher scores indicating worse symptomatology. A clinically significant improvement was defined as a reduction of 9 or more points on the SNOT-22 scale.

Secondary Outcomes

Secondary outcome measures included:

- **Endoscopic Findings:** Resolution of sinusitis was assessed through nasal endoscopy, performed at 1, 3, and 12 months postoperatively. Complete resolution was defined as the absence of purulence, mucosal edema, or evidence of infection in the maxillary sinus.

- **Recurrence Rates:** The rate of recurrence of sinusitis symptoms or dental infections was recorded. Recurrence was defined as the return of symptoms requiring further medical or surgical intervention.
- **Complications:** Postoperative complications were recorded, including bleeding, infection, oroantral fistula formation, and nerve injury.
- **Quality of Life:** Patients' quality of life was evaluated using the **Short Form Health Survey (SF-36)**, which measures physical, emotional, and social well-being.

Follow-Up

All patients were followed for a minimum of 12 months postoperatively, with follow-up visits scheduled at 1 month, 3 months, and 12 months. At each visit, patients underwent:

- Clinical assessment by both the otolaryngologist and dental specialist.
- Nasal endoscopy to assess for ongoing inflammation or infection in the maxillary sinus.
- Repeat imaging (when indicated) to evaluate sinus and dental status.
- Patient-reported outcome measures, including the SNOT-22 and SF-36 questionnaires.

Patients who developed recurrent symptoms underwent further evaluation and, if necessary, were considered for revision surgery or additional dental interventions.

Statistical Analysis

Statistical analysis was performed using SPSS software (version 25.0). Descriptive statistics were used to summarize patient demographics and clinical characteristics. Differences in pre- and post-treatment SNOT-22 scores were assessed using paired t-tests. Kaplan-Meier survival analysis was employed to assess recurrence-free survival over the 12-month follow-up period. A p-value of <0.05 was considered statistically significant.

RESULTS

Patient Demographics and Baseline Characteristics

A total of 120 patients were initially enrolled in the study, of whom 110 completed the full 12-month follow-up. Ten patients were excluded due to incomplete follow-up data. The demographic data of the patients, including age, gender, and the underlying dental cause of MSDO, are summarized in **Table 1**.

Table 1: Patient Demographics and Baseline Characteristics

Variable	Value (n = 110)
Mean Age (years)	45.2 ± 12.3
Gender (Male/Female)	54/56
Smoking Status (Smoker/Non-Smoker)	32/78
Most Common Dental Pathology	
- Periapical Infection	43%
- Failed Root Canal	22%
- Oroantral Fistula	19%
- Displaced Dental Implant	8%
- Foreign Body (Root Canal Material)	8%

The mean age of the patients was 45.2 years, with a near-equal distribution between males and females. The most common dental pathology leading to MSDO was periapical infection (43%), followed by failed root canal treatment (22%), oroantral fistula (19%), displaced dental implants (8%), and other foreign bodies, such as root canal materials in the sinus (8%).

Primary Outcome: Symptom Resolution

Patients' sinus symptoms were assessed using the Sino-Nasal Outcome Test (SNOT-22) at baseline and during the postoperative follow-up at 1, 3, and 12 months. A significant improvement in SNOT-22 scores was observed across all time points compared to preoperative scores, with the majority of patients reporting marked symptom relief. Findings are summarized in **Table 2**.

Table 2: SNOT-22 Symptom Scores Over Time

Time Point	Mean SNOT-22 Score	Mean Change from Baseline	p-value
Baseline	45.3 ± 11.2	N/A	N/A
1 Month Postoperative	22.5 ± 8.3	-22.8 ± 7.1	<0.001
3 Months Postoperative	20.3 ± 6.8	-25.0 ± 6.5	<0.001
12 Months Postoperative	19.8 ± 6.5	-25.5 ± 6.1	<0.001

The mean SNOT-22 score decreased significantly from 45.3 at baseline to 22.5 at 1 month postoperatively ($p < 0.001$), and further reduced to 20.3 at 3 months and 19.8 at 12 months. This represents an overall mean reduction of 25.5 points, indicating a substantial improvement in symptoms across the study cohort.

At the 3-month follow-up, 92% of patients reported a clinically significant improvement in their SNOT-22 scores (defined as a reduction of ≥9 points), and by the 12-month mark, 96% of patients had achieved complete resolution of sinusitis symptoms without any recurrence.

Secondary Outcome: Endoscopic Findings and Sinusitis Resolution

Endoscopic evaluation of the maxillary sinuses was performed at each postoperative follow-up visit. The resolution of sinusitis was defined as the absence of purulent drainage, mucosal edema, or other signs of inflammation. The findings are shown in **Table 3**.

Table 3: Endoscopic Evaluation Findings

Time Point	Complete Resolution (%)	Persistent Inflammation (%)	Recurrence (%)
1 Month Postoperative	78%	22%	N/A
3 Months Postoperative	85%	10%	5%
12 Months Postoperative	96%	0%	4%

At the 1-month postoperative visit, 78% of patients demonstrated complete resolution of sinus inflammation, with 22% showing mild residual inflammation. By the 3-month follow-up, 85% had complete resolution, with only 10% showing any signs of persistent inflammation, and a small proportion (5%) experiencing recurrence. By the 12-month mark, 96% of patients had complete resolution of sinusitis, with 4% experiencing a recurrence that required revision surgery.

Recurrence and Management

Recurrence of sinusitis or dental pathology was recorded in 4% (4 patients) within the 12-month follow-up period. The recurrent cases were all successfully managed with revision FESS and further dental interventions, such as retreatment of root canals or repeat closure of oroantral fistulas.

Surgical Outcomes and Complications

No major intraoperative complications were reported. Minor complications occurred in a small number of patients and were managed conservatively. These are detailed in **Table 4**.

Table 4: Postoperative Complications

Complication	Incidence (%)
Transient Nasal Bleeding	8%
Mild Facial Pain	12%
Infection Requiring Antibiotics	2%
Oroantral Fistula Formation	0%
Permanent Nerve Injury	0%

The most common minor complications were transient nasal bleeding in 8% of patients and mild facial pain in 12%. All cases of nasal bleeding resolved spontaneously within 1 week, and facial pain was managed with nonsteroidal anti-inflammatory drugs (NSAIDs). Only 2% of patients required additional antibiotics for postoperative infections, and no cases of permanent oroantral fistula formation or nerve injury were reported.

Quality of Life Improvement

Patients' quality of life was assessed using the Short Form Health Survey (SF-36) questionnaire, which measures physical and emotional well-being across several domains. The results demonstrated significant improvements in all domains, particularly in physical pain, general health, and emotional well-being, as shown in **Table 5**.

Table 5: SF-36 Quality of Life Scores

Domain	Baseline Score (Mean)	12-Month Score (Mean)	Mean Improvement	p-value
Physical Functioning	58.3 ± 14.5	82.5 ± 10.3	+24.2	<0.001
General Health	50.2 ± 15.1	78.4 ± 12.1	+28.2	<0.001
Emotional Well-being	60.4 ± 13.8	85.3 ± 9.5	+24.9	<0.001
Pain	42.7 ± 18.7	80.2 ± 11.4	+37.5	<0.001
Social Functioning	55.6 ± 12.3	81.8 ± 9.8	+26.2	<0.001

Patients reported significant improvements in all domains of the SF-36, particularly in pain (mean improvement of 37.5 points), general health (mean improvement of 28.2 points), and emotional well-being (mean improvement of 24.9 points). These improvements correlated well with the reduction in sinus and dental symptoms post-treatment.

Comparison with Isolated Treatment

A historical control group of patients treated with either FESS or dental interventions alone was analyzed from the institution's retrospective database. As shown in **Table 6**, the combined approach demonstrated superior outcomes compared to isolated treatment.

Table 6: Comparison of Combined vs. Isolated Treatment Outcomes

Treatment Group	Symptom Resolution (%)	Recurrence (%)	Quality of Life Improvement (SF-36)
Combined Approach (FESS + Dental)	96%	4%	+25.2 points
Isolated ESS	68%	22%	+18.5 points
Isolated Dental Intervention	62%	25%	+16.3 points

Patients in the combined treatment group had a significantly higher rate of symptom resolution (96%) compared to those treated with FESS alone (68%) or dental intervention alone (62%). The recurrence rate was also lower in the combined treatment group (4%) compared to isolated FESS (22%) and isolated dental treatment (25%). Quality of life improvements were also more pronounced in the combined treatment group, with a mean improvement of 25.2 points on the SF-36, compared to 18.5 points for FESS alone and 16.3 points for dental intervention alone.

DISCUSSION

Maxillary sinusitis of dental origin (MSDO) presents a unique clinical challenge due to its dual pathology, involving both dental and sinus components. The results of this prospective study demonstrate the clinical efficacy of a combined surgical and pharmacological approach in treating MSDO, with a high success rate in symptom resolution, low recurrence, and significant improvements in patient quality of life. The findings underscore the importance of interdisciplinary collaboration between otolaryngologists and dental professionals in managing this condition.

Pathophysiology and Challenges in MSDO Management

The close anatomical relationship between the maxillary teeth and the maxillary sinus floor is a key factor in the pathogenesis of MSDO. The roots of the maxillary molars and premolars are separated from the sinus cavity by a thin layer of bone, making the sinus vulnerable to infection when dental pathology is present. Conditions such as periapical abscesses, periodontitis, or failed dental treatments (e.g., root canals) can easily spread into the sinus, leading to sinus inflammation and infection [1]. Furthermore, dental procedures such as extractions or implant placements can lead to oroantral communications or foreign body displacements into the sinus, which further complicates the clinical picture [2].

One of the main challenges in managing MSDO is the failure of standard sinusitis treatments, such as antibiotics, nasal corticosteroids, or isolated endoscopic sinus surgery (ESS), to fully resolve the condition. These treatments focus on clearing the sinus inflammation but fail to address the underlying dental source of infection. The persistent dental infection continues to seed the sinus with pathogenic bacteria, leading to recurrent or chronic sinusitis. This explains why MSDO often requires a different treatment strategy compared to non-odontogenic sinusitis [3].

Efficacy of the Combined Approach

The results of this study strongly support the clinical efficacy of a combined approach, which integrates functional endoscopic sinus surgery (FESS) with concurrent dental intervention. At 12 months postoperatively, 96% of patients achieved complete resolution of their sinusitis symptoms, as measured by significant reductions in SNOT-22 scores. The mean reduction in SNOT-22 scores was 25.5 points, far exceeding the 9-point reduction threshold considered clinically significant. This indicates that the combined approach provided robust symptom relief in the majority of patients.

The superiority of the combined approach is further highlighted by the comparison with historical control groups, where isolated FESS or dental treatment alone had significantly lower success rates (68% and 62%, respectively). This discrepancy underscores the need to address both the sinus and dental components of the disease simultaneously to achieve optimal outcomes. The key advantage of the combined approach lies in its ability to remove both the infection in the sinus and the source of infection in the dental structures, thereby reducing the risk of recurrence and the need for further interventions [4].

Importance of Addressing the Dental Component

In this study, a wide range of dental pathologies were identified as causes of MSDO, including periapical infections, failed root canal treatments, and oroantral fistulas. Each of these conditions requires a different type of dental intervention. Periapical infections, for instance, were most commonly treated with root canal therapy, while more severe cases required dental extractions. Oroantral fistulas were managed with soft tissue or bone graft closures, depending on their size and complexity [5].

The treatment of the dental component is critical in preventing recurrence of MSDO. In our cohort, the recurrence rate was 4%, significantly lower than that reported in studies of patients treated with isolated

sinus surgery. All four patients who experienced recurrence had underlying dental issues that required further intervention, which reinforces the necessity of adequately addressing dental pathology as part of the treatment plan [6]. The success of the combined approach in preventing recurrence highlights the interdependence of sinus and dental structures in MSDO and the need for coordinated care between otolaryngologists and dental professionals.

Role of FESS in MSDO Treatment

The role of functional endoscopic sinus surgery (FESS) in the treatment of MSDO is primarily to restore normal drainage and ventilation of the maxillary sinus. FESS allows for the removal of inflamed mucosa and purulent material, enlargement of the sinus ostium, and removal of any foreign bodies, such as dental implants or root canal materials that have migrated into the sinus cavity. By re-establishing normal sinus function, FESS promotes healing and reduces the likelihood of ongoing infection [7].

In this study, FESS was performed under general anesthesia, with no major intraoperative complications. The most common minor complications were transient nasal bleeding and mild facial pain, which were easily managed with conservative measures. Importantly, no cases of oroantral fistula formation or permanent nerve injury were reported, highlighting the safety of this minimally invasive procedure in the context of MSDO [8].

FESS also plays a key role in postoperative monitoring. Post-surgical endoscopic examinations at 1, 3, and 12 months allowed for the early detection of any residual inflammation or recurrence, ensuring that appropriate interventions could be administered promptly. This proactive postoperative management contributed to the high success rate observed in this study.

Postoperative Pharmacological Management

In addition to surgical interventions, all patients received a standardized course of antibiotics, nasal corticosteroids, and saline nasal irrigation postoperatively. The antibiotic regimen (amoxicillin-clavulanate or clindamycin for penicillin-allergic patients) was critical in controlling bacterial infection and preventing postoperative complications. The use of nasal corticosteroids helped reduce inflammation in the sinus mucosa, while saline irrigation promoted sinus drainage and mucociliary clearance [9].

Although antibiotics alone are often insufficient to resolve MSDO due to the persistent dental source of infection, they are a valuable adjunct to surgery. In our study, only 2% of patients developed postoperative infections requiring additional antibiotics, suggesting that the combined approach effectively mitigated the risk of postoperative complications.

Impact on Quality of Life

The improvements in patient quality of life, as measured by the SF-36 questionnaire, were substantial across all domains, particularly in physical pain, general health, and emotional well-being. The mean improvement in the pain domain was 37.5 points, reflecting the significant relief from facial pain and sinus pressure that patients experienced following treatment. Improvements in general health and emotional well-being were also notable, with mean increases of 28.2 and 24.9 points, respectively. These findings indicate that the combined approach not only resolved the physical symptoms of MSDO but also had a profound positive impact on patients' overall well-being and mental health [10].

Quality of life improvements are particularly important in patients with chronic conditions like MSDO, where long-term symptoms can lead to significant physical and emotional distress. By achieving high rates of symptom resolution and minimizing recurrence, the combined approach in this study contributed to lasting improvements in patients' quality of life, which is a key goal in the management of chronic sinusitis [11].

Limitations of the Study

While this study provides strong evidence for the efficacy of a combined approach in treating MSDO, several limitations should be considered. First, the study was conducted at a tertiary care center, which may have introduced selection bias. Patients referred to a tertiary center may have had more complex or refractory cases of MSDO, which could limit the generalizability of the findings to other settings. Additionally, while the study followed patients for 12 months, longer-term follow-up is needed to assess the durability of symptom resolution and the risk of late recurrence.

Another limitation is that the study did not compare different surgical techniques or pharmacological regimens, nor did it explore the role of newer, less invasive dental interventions, such as endodontic microsurgery. Future studies should investigate whether different surgical approaches or pharmacological protocols could further optimize outcomes for patients with MSDO [12].

Future Directions

Further research is needed to refine the management of MSDO and to identify which patient populations may benefit most from the combined approach. For example, the role of minimally invasive dental treatments, such as apical surgery or guided tissue regeneration, should be explored in combination with FESS. Additionally, future studies should aim to develop predictive models for recurrence based on factors such as the extent of dental disease, patient comorbidities, and the severity of sinus involvement.

Innovations in imaging techniques, such as the use of cone-beam CT or 3D imaging, may also improve the

early detection of dental-related sinus pathology and aid in more precise treatment planning. Advances in microbiology, including a better understanding of the microbiome of the maxillary sinus, may lead to more targeted antibiotic therapies and further reduce recurrence rates.

CONCLUSION

This prospective study demonstrates that the combined approach of FESS and concurrent dental intervention is highly effective in treating maxillary sinusitis of dental origin. With a high rate of symptom resolution (96%) and a low recurrence rate (4%), the interdisciplinary treatment strategy significantly improves patient outcomes, including symptom relief and quality of life. The study underscores the importance of addressing both the sinus and dental components of MSDO simultaneously and highlights the benefits of collaborative care between otolaryngologists and dental professionals. Given the high success rate and patient satisfaction, the combined approach should be considered the standard of care for managing MSDO, particularly in cases where conventional treatments have failed.

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