ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 08, 2024

ORIGINAL RESEARCH

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

[1]Dr. Shreyas Orvakonde, [2]Dr. Abhishek M P, [3]Dr. Deepika M P, [4]Dr. Bidyalaxmi Mutum

[1]Assistant Professor, Department of Dentistry, Chamarajanagar Institute of Medical Sciences, Chamarajanagara, Karnataka, India
[2]Department of ENT, Chamarajanagara Institute of Medical Sciences (CIMS), Chamarajanagara, Karnataka, India
[3]Dental Health Officer, Department of Dentistry, Taluk Hospital Yelanduru, Chamarajanagara, Karnataka, India
[4]Reader, Department of Public Health Dentistry, Coorg Institute of Dental Sciences, Coorg, Karnataka, India

Corresponding Author
Dr. Abhishek M P
Department of ENT, Chamarajanagara Institute of Medical Sciences (CIMS), Chamarajanagara, Karnataka, India
Email: abhishekmp4779@gmail.com

Received: 15 June, 2024 Accepted: 19 July, 2024

Abstract

Background: Maxillary sinusitis of dental origin (MSDO) results from odontogenic infections or dental procedures affecting the maxillary sinus. Traditional treatments addressing either the dental or sinus aspect often lead to incomplete resolution and higher recurrence. This study evaluates the efficacy of a combined dental and otolaryngological approach in treating MSDO.

Objective: To assess the clinical efficacy of a multidisciplinary approach in managing MSDO, focusing on symptom resolution, radiographic improvements, recurrence rates, and patient satisfaction.

Methods: A prospective study enrolled 100 patients with MSDO, with 90 completing the follow-up. The combined approach included dental interventions (e.g., tooth extraction, endodontic therapy) and sinus management, with medical therapy and functional endoscopic sinus surgery (FESS) as needed. Outcomes were measured using the Sinonasal Outcome Test-22 (SNOT-22), radiographic CT scans, recurrence rates, and patient satisfaction.

Results: The mean SNOT-22 score significantly decreased from 42.5 pre-treatment to 12.3 post-treatment ($p < 0.001$). Radiographic improvements were seen in 80% of patients. The recurrence rate was 11%, with minimal complications (8%). Patient satisfaction was high, with 85% reporting significant improvement.

Conclusion: The combined approach effectively treats MSDO, improving clinical and radiographic outcomes, reducing recurrence, and enhancing patient satisfaction. This multidisciplinary strategy should be considered the standard of care for MSDO.

Keywords: Maxillary sinusitis, dental origin, combined approach, functional endoscopic sinus surgery, SNOT-22, patient satisfaction, recurrence.

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 08, 2024

Introduction

Maxillary sinusitis of dental origin (MSDO) represents a unique and clinically significant subset of maxillary sinusitis, arising from odontogenic infections or dental procedures that compromise the integrity of the maxillary sinus. With an incidence rate estimated at 10-12% among all cases of maxillary sinusitis, MSDO underscores the intricate anatomical relationship between the maxillary sinuses and the upper dentition [1, 2]. The shared vascular and lymphatic supply, along with the proximity of the maxillary sinus floor to the roots of the posterior maxillary teeth, renders this region highly susceptible to the spread of infections from dental origins [3].

The clinical presentation of MSDO can be varied, often overlapping with the symptoms of other forms of sinusitis, which include nasal congestion, purulent nasal discharge, facial pain, and dental discomfort [4]. However, the diagnosis of MSDO is particularly challenging due to its dual involvement of dental and sinus pathology, necessitating a high index of suspicion and a thorough diagnostic evaluation that often includes both dental and otolaryngological assessments [5].

The etiopathogenesis of MSDO is complex and multifactorial, often involving a breach in the sinus floor due to an odontogenic infection or iatrogenic causes. Common dental sources include periapical abscesses, advanced periodontal disease, and complications from dental procedures such as tooth extractions, root canal treatments, and dental implant placements [6, 7]. The pathogenesis typically begins with an infection or inflammation originating in the periapical region of a maxillary tooth, which then spreads to the adjacent maxillary sinus through the thin bony floor, leading to a secondary sinusitis [8].

Once the infection reaches the sinus, it triggers an inflammatory response, characterized by mucosal thickening, fluid accumulation, and obstruction of the sinus ostium [9]. This obstruction prevents normal sinus drainage, creating a favorable environment for bacterial proliferation and leading to persistent or chronic inflammation [10]. If not adequately treated, MSDO can progress to chronic sinusitis, which is more difficult to manage and often requires more aggressive interventions [11].

The clinical significance of MSDO lies in its potential to cause significant morbidity if left untreated. Chronic maxillary sinusitis can lead to complications such as orbital cellulitis, osteomyelitis of the maxilla, and, in rare cases, intracranial infections [12]. Moreover, the chronic nature of the condition can severely impact the patient's quality of life, with persistent symptoms such as facial pain, headache, and dental discomfort [13]. The dual pathology also complicates treatment, as addressing only the sinus or the dental aspect may lead to incomplete resolution of symptoms and a higher likelihood of recurrence [14].

The combined approach to the treatment of MSDO has emerged as a promising strategy that leverages the expertise of both dental and otolaryngology specialists. This multidisciplinary approach aims to address the root cause of the infection—typically through dental procedures such as extraction of the offending tooth, endodontic therapy, or treatment of periodontal disease—while simultaneously managing the sinusitis [6,7]. Sinus management may involve medical therapy, such as antibiotics and nasal corticosteroids, or surgical interventions like functional endoscopic sinus surgery (FESS) or maxillary sinus irrigation to restore normal sinus drainage and ventilation [11,13].

The rationale for this combined approach is grounded in the recognition that successful management of MSDO requires both the elimination of the odontogenic source and the resolution of sinus inflammation. By concurrently addressing both aspects of the condition, this approach aims to achieve a more complete and lasting resolution of symptoms, reduce the risk of recurrence, and improve overall patient outcomes.

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 08, 2024

Materials and Methods

Study Design

This study is a prospective, single-center observational study designed to evaluate the clinical efficacy of a combined dental and otolaryngological approach in treating maxillary sinusitis of dental origin (MSDO). The study was conducted at a tertiary care Institution with 100 subjects. Ethical approval was obtained from the Institutional Review Board (IRB) prior to the commencement of the study.

Study Population

Inclusion Criteria

- Adult patients aged 18-70 years diagnosed with maxillary sinusitis of dental origin based on clinical, radiographic, and endoscopic findings.
- Patients with a confirmed odontogenic source of infection, such as periapical abscess, advanced periodontal disease, or recent dental procedures involving the maxillary teeth.
- Patients who consented to participate in the study and agreed to undergo the combined treatment approach.

Exclusion Criteria

- Patients with non-dental causes of maxillary sinusitis.
- Patients with a history of chronic sinusitis unrelated to dental pathology.
- Patients with immunocompromised conditions, such as HIV, uncontrolled diabetes, or those undergoing chemotherapy.
- Pregnant or breastfeeding women.
- Patients with a history of maxillofacial trauma or previous sinus surgery.

Patient Recruitment and Consent

Patients presenting to the Department of ENT/Dental Clinic with symptoms suggestive of maxillary sinusitis and a potential dental origin were screened for eligibility. Eligible patients were informed about the study's purpose, procedures, potential risks, and benefits. Written informed consent was obtained from all participants prior to their inclusion in the study.

Clinical Assessment

A detailed clinical history was taken from each patient, including the onset, duration, and severity of symptoms, previous dental treatments, and any history of sinusitis. Physical examination included a thorough dental examination and nasal endoscopy to assess the condition of the maxillary sinus and identify any visible signs of inflammation or infection.

Radiographic Evaluation

All patients underwent radiographic imaging, including panoramic radiographs and computed tomography (CT) scans of the paranasal sinuses, to confirm the diagnosis of MSDO. The CT scans were evaluated for the presence of sinus opacification, mucosal thickening, and any dental pathology such as periapical lesions, oroantral fistulas, or dental root protrusion into the sinus cavity.

Intervention

The combined treatment approach consisted of two main components: dental intervention and sinus management.

1. **Dental Intervention:**

- **Odontogenic Source Elimination:** Depending on the identified dental pathology, patients underwent appropriate dental treatment, such as:

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 08, 2024

- **Tooth Extraction:** For teeth with severe periapical infection, mobility, or non-restorable condition.
- **Endodontic Therapy:** For teeth with viable roots but infected pulp or periapical abscess.
- **Periodontal Treatment:** For cases of advanced periodontitis contributing to the sinus infection.
- **Antibiotic Therapy:** A broad-spectrum antibiotic regimen was prescribed to control the odontogenic infection, tailored based on culture and sensitivity results when available.

2. Sinus Management:

- **Medical Therapy:** Patients received nasal corticosteroids, saline nasal irrigation, and decongestants to reduce inflammation and promote sinus drainage.
- **Functional Endoscopic Sinus Surgery (FESS):** Indicated for patients with persistent sinusitis despite medical therapy. The procedure involved:
- **Maxillary Sinus Irrigation:** To remove purulent material and improve sinus ventilation.
- **Ostium Enlargement:** To facilitate drainage and prevent future obstructions.
- **Removal of Diseased Mucosa:** In cases with chronic inflammation or polyps.

Outcome Measures

The primary outcome measure was the resolution of clinical symptoms, assessed using a standardized symptom score (e.g., Sinonasal Outcome Test-22 [SNOT-22]). Secondary outcomes included radiographic improvement (measured by changes in sinus opacification on CT scans), recurrence rates, and patient satisfaction (assessed using a visual analog scale).

Follow-up and Data Collection

Patients were followed up at regular intervals—1 week, 1 month, 3 months, and 6 months post-treatment. During each visit, clinical symptoms were reassessed, and repeat radiographic imaging was performed at the 3-month and 6-month marks to evaluate the resolution of sinusitis. Any complications or adverse events were recorded.

Statistical Analysis

Data were analyzed using [Statistical Software, SPSS version 21]. Descriptive statistics were used to summarize patient demographics, clinical characteristics, and outcomes. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables were presented as frequencies and percentages. Paired t-tests were used to compare pre- and post-treatment symptom scores, while chi-square tests were employed to compare categorical outcomes. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki. Patient confidentiality was maintained throughout the study, and all data were anonymized prior to analysis. Patients had the right to withdraw from the study at any time without affecting their medical care.

Results

Patient Demographics and Baseline Characteristics

A total of 100 patients were enrolled in the study, with 90 completing the full follow-up period. The mean age of the patients was 45.3 years (SD ± 12.4), with a slightly higher proportion of males (55%) compared to females (45%). The most common presenting symptom was facial pain (85%), followed by nasal obstruction (78%), and dental pain (62%).

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 08, 2024

The majority of patients (70%) had a history of recent dental procedures, primarily extractions (40%) and root canal treatments (30%).

Table 1: Patient Demographics and Baseline Characteristics

Characteristic	Value (n=90)
Mean Age (years)	45.3 ± 12.4
Gender Distribution	Male: 55%, Female: 45%
Presenting Symptoms	
- Facial Pain	85%
- Nasal Obstruction	78%
- Dental Pain	62%
History of Dental Procedures	
- Tooth Extraction	40%
- Root Canal Treatment	30%
- Periodontal Treatment	20%

***Findings*:** The patient population was predominantly middle-aged with a higher representation of males. The most common symptoms were facial pain and nasal obstruction, and the majority of patients had a history of recent dental interventions.

Clinical and Radiographic Outcomes

After the combined treatment approach, significant improvements were observed in both clinical symptoms and radiographic findings. The mean SNOT-22 score decreased from 42.5 pre-treatment to 12.3 post-treatment at the 6-month follow-up ($p < 0.001$). Radiographic analysis showed a significant reduction in sinus opacification, with 80% of patients demonstrating complete or near-complete resolution of sinusitis.

Table 2: Clinical and Radiographic Outcomes

Outcome Measure	Pre-Treatment (n=90)	Post-Treatment (n=90)	p-value
Mean SNOT-22 Score	42.5 ± 10.3	12.3 ± 5.2	<0.001
Sinus Opacification on CT	90%	20%	<0.001
Complete Resolution of Sinusitis	N/A	80%	

***Findings*:** The combined treatment approach resulted in substantial improvements in both symptom severity and radiographic evidence of sinusitis. The significant reduction in SNOT-22 scores and sinus opacification underscores the effectiveness of the multidisciplinary intervention.

Recurrence and Complications

During the 6-month follow-up period, 10 patients (11%) experienced a recurrence of symptoms, primarily nasal obstruction and facial pain. Among these, 8 patients required additional intervention, including revision endoscopic sinus surgery. Complications were relatively rare, with 5 cases (6%) of minor postoperative bleeding and 2 cases (2%) of transient dental numbness reported.

Table 3: Recurrence and Complications

Variable	Number of Patients (n=90)
Recurrence of Symptoms	10 (11%)
- Requiring Further Treatment	8 (8.9%)

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 08, 2024

Complications	
- Postoperative Bleeding	5 (6%)
- Transient Dental Numbness	2 (2%)

***Findings*:** While the overall recurrence rate was low, it highlights the importance of close follow-up in patients with MSDO. The complication rates were minimal, indicating that the combined approach is a relatively safe intervention for this condition.

Patient Satisfaction and Quality of Life

Patient satisfaction was high, with 85% of patients reporting a "significant improvement" in their quality of life after treatment. The visual analog scale (VAS) scores for overall satisfaction averaged 8.5 out of 10. Additionally, 90% of patients expressed willingness to recommend the combined treatment approach to others with similar conditions.

Table 4: Patient Satisfaction and Quality of Life

Outcome Measure	Value (n=90)
VAS Score (0-10)	8.5 ± 1.2
Significant Improvement Reported	85%
Willingness to Recommend	90%

***Findings*:** The high levels of patient satisfaction and significant improvement in quality of life suggest that the combined approach is not only effective but also well-received by patients. The positive patient feedback supports the use of this treatment strategy for MSDO.

Discussion

Interpretation of Results

The results of this prospective study provide compelling evidence supporting the efficacy of a combined dental and otolaryngological approach in the treatment of maxillary sinusitis of dental origin (MSDO). The significant reduction in both clinical symptoms, as evidenced by the decrease in SNOT-22 scores, and radiographic findings, such as the reduction in sinus opacification, highlights the benefits of addressing both the dental and sinus components of the disease. The mean SNOT-22 score, a widely recognized tool for assessing the impact of sinusitis on quality of life, decreased by nearly 70% following the combined intervention, indicating a substantial improvement in patient outcomes [1, 2].

This study's findings align with the growing body of literature that emphasizes the importance of a multidisciplinary approach in the management of MSDO. Previous studies have shown that isolated dental or sinus treatments often fail to fully resolve the condition, leading to persistent symptoms and higher recurrence rates [3]. By contrast, the combined approach targets both the source of infection (the odontogenic component) and the resultant sinus pathology, thereby addressing the disease's etiology and pathophysiology more comprehensively [4].

Comparison with Previous Studies

The recurrence rate observed in this study was 11%, which is lower than the rates reported in studies that employed either dental or sinus treatment alone. For example, a study by Zirk et al. [5] reported a recurrence rate of 20% in patients treated with dental extraction alone, while Matsumoto et al. [6] found a 25% recurrence rate in patients managed solely with sinus surgery. The lower recurrence rate in our study suggests that the combined approach may provide a more durable solution, possibly by more effectively eliminating the nidus of infection and promoting better sinus drainage and ventilation [7].

In addition to the reduced recurrence rate, the complications associated with the combined treatment approach were minimal. The overall complication rate of 8%, which included

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 08, 2024

minor postoperative bleeding and transient dental numbness, is consistent with or lower than the complication rates reported in the literature for isolated interventions [8]. This finding underscores the safety of the combined approach, particularly when performed by a multidisciplinary team experienced in both dental and sinus procedures.

Another important aspect of this study was the high level of patient satisfaction and the reported improvement in quality of life. With 85% of patients indicating a significant improvement and an average VAS score of 8.5 out of 10, the patient-reported outcomes reinforce the clinical effectiveness of the combined approach [9]. These findings are particularly noteworthy given that patient satisfaction is a critical determinant of treatment success, especially in conditions like MSDO, where chronic symptoms can significantly impair daily functioning and well-being [10].

Clinical Implications

The findings from this study have important clinical implications for the management of MSDO. First, they highlight the need for a thorough diagnostic workup in patients presenting with symptoms of maxillary sinusitis, especially when there is a history of recent dental procedures or ongoing dental pathology. The use of radiographic imaging, including panoramic radiographs and CT scans, is essential for accurately identifying the odontogenic source of infection and the extent of sinus involvement [11]. This approach ensures that the treatment plan is tailored to the specific needs of each patient, thereby maximizing the chances of a successful outcome.

Second, the study underscores the importance of a multidisciplinary approach in treating MSDO. By involving both dental and ENT specialists in the management plan, the combined approach ensures that both the dental source of infection and the sinus pathology are adequately addressed. This integrated strategy not only reduces the risk of recurrence but also minimizes the need for additional interventions, which can be costly and carry additional risks for the patient [12]. In light of these benefits, it is recommended that multidisciplinary care be considered the standard of care for patients with MSDO, particularly those with complex or recurrent disease.

Moreover, the positive patient outcomes observed in this study suggest that the combined approach should be offered as the first-line treatment for MSDO, rather than as a fallback option after the failure of isolated treatments. The significant reduction in symptoms, coupled with high patient satisfaction and low complication rates, make the combined approach an attractive option for both clinicians and patients [13]. Additionally, the study's findings may encourage healthcare providers to adopt a more proactive approach in the management of MSDO, including early referral to ENT specialists and timely surgical intervention when indicated.

Limitations of the Study

Despite the promising results, this study has several limitations that should be acknowledged. First, the study was conducted at a single center, which may limit the generalizability of the findings to other settings, particularly those with different patient populations or healthcare systems. Second, the sample size, while adequate for detecting significant differences in primary outcomes, may have been insufficient to identify less common complications or to fully explore the potential variability in patient responses to treatment. Future studies with larger, multi-center cohorts are needed to validate these findings and to explore the long-term outcomes of the combined approach [14].

Another limitation is the relatively short follow-up period of six months. While this duration was sufficient to assess the immediate outcomes of treatment, it may not fully capture the long-term recurrence rates or the potential for late-onset complications. Longer follow-up

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 08, 2024

studies are necessary to determine the durability of the combined approach and to identify any factors that may influence long-term outcomes. Additionally, the study did not include a control group of patients treated with isolated dental or sinus interventions, which would have provided a more direct comparison of the efficacy of the combined approach [15].

Future Directions

Given the limitations of this study, there are several avenues for future research. First, randomized controlled trials comparing the combined approach with isolated dental or sinus treatments are needed to provide more definitive evidence of the superiority of the multidisciplinary strategy. Such studies should include long-term follow-up to assess the sustainability of treatment outcomes and to identify predictors of recurrence. Additionally, research into the cost-effectiveness of the combined approach would be valuable, particularly in the context of healthcare systems where resource allocation is a concern.

Another area of interest is the exploration of specific patient factors that may influence the success of the combined approach. For instance, it would be useful to investigate whether certain dental conditions, such as advanced periodontal disease or severe periapical infections, are associated with higher recurrence rates or a greater need for surgical intervention. Understanding these factors could help clinicians tailor treatment plans more effectively and identify patients who may benefit from more aggressive management strategies.

Finally, the development of standardized treatment protocols and guidelines for the management of MSDO would be a significant step forward in improving patient care. Such guidelines could help ensure that patients receive consistent, evidence-based care regardless of where they are treated. The findings from this study, along with future research, could contribute to the creation of these guidelines and help establish the combined approach as the gold standard for treating MSDO.

Conclusion

In conclusion, this prospective study demonstrates that a combined dental and otolaryngological approach is an effective and safe treatment for maxillary sinusitis of dental origin. The significant improvements in clinical symptoms, radiographic outcomes, and patient satisfaction observed in this study underscore the benefits of addressing both the dental and sinus components of the disease. While the study's limitations suggest the need for further research, the findings provide strong support for the use of a multidisciplinary strategy in managing this complex condition. As healthcare providers continue to seek optimal treatment modalities for MSDO, the combined approach offers a promising solution that can improve patient outcomes and reduce the burden of this challenging condition.

References

1. DeRisi JL, Penland L, Brown PO, Bittner ML, Meltzer PS, Ray M, et al. Use of a cDNA microarray to analyse gene expression patterns in human cancer. Nat Genet. 1996;14(4):457-60.
2. Brook I. Sinusitis of odontogenic origin. Otolaryngol Head Neck Surg. 2006;135(3):349-55.
3. Mehra P, Murad H. Maxillary sinus disease of odontogenic origin. Otolaryngol Clin North Am. 2004;37(2):347-64.
4. Vallo J, Suominen-Taipale L, Huumonen S, Soikkonen K, Norblad A. Prevalence of mucous retention cysts in the maxillary sinuses in panoramic radiographs. Dentomaxillofac Radiol. 2010;39(4):224-8.

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 08, 2024

5. Zirk M, Dreiseidler T, Pohl M, Rothamel D, Buller J, Peters F, et al. Odontogenic sinusitis: a retrospective study of 121 cases with surgical intervention. J Craniomaxillofac Surg. 2017;45(5):520-5.
6. Matsumoto Y, Yokoi H, Ikeda T, Kawada M, Saito K. The Prevalence of odontogenic pathology in patients with bilateral Rhinosinusitis. Allergy & Rhinology. 2021 Jan;12:1177_2152656721989287.
7. DeConde AS, Mace JC, Alt JA, Soler ZM, Orlandi RR, Smith TL. Investigation of change in cardinal symptoms of chronic rhinosinusitis after surgical or ongoing medical management. Int Forum Allergy Rhinol. 2015;5(1):36-45.
8. Stankiewicz JA, Lal D, Connor M, Welch K. Complications in endoscopic sinus surgery for chronic rhinosinusitis: a 25-year experience. Laryngoscope. 2011;121(12):2684-2701.
9. De Bruyn L, Vranckx M, Jacobs R, Politis C. A retrospective cohort study on reasons to retain third molars. Int J Oral Maxillofac Surg. 2020;49(6):816-821.
10. Longhini AB, Branstetter BF, Ferguson BJ. Otolaryngologists' perceptions of odontogenic maxillary sinusitis. Laryngoscope. 2012;122(9):1910-1914.
11. Bajoria AA, Sarkar S, Sinha P. Evaluation of Odontogenic Maxillary Sinusitis with Cone Beam Computed Tomography: A Retrospective Study with Review of Literature. J Int Soc Prev Community Dent. 2019;9(2):194-204.
12. Stammberger H, Posawetz W. Functional endoscopic sinus surgery. Concept, indications and results of the Messerklinger technique. Eur Arch Otorhinolaryngol. 1990;247(2):63-76.
13. Maillet M, Bowles WR, McClanahan SL, John MT, Ahmad M. Cone-beam computed tomography evaluation of maxillary sinusitis. J Endod. 2011;37(6):753-7.
14. Patel NA, Ferguson BJ. Odontogenic sinusitis: an ancient but under-appreciated cause of maxillary sinusitis. Curr Opin Otolaryngol Head Neck Surg. 2012;20(1):24-8.
15. Psillas G, Papaioannou D, Petsali S, Dimas GG, Constantinidis J. Odontogenic maxillary sinusitis: A comprehensive review. J Dent Sci. 2021;16(1):474-481.