



Treatment of non-chronic odontogenic sinusitis: maxillary sinus lavage via extraction socket after tooth or implant removal

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Abstract (J Korean Assoc Oral Maxillofac Surg 2025;51:168-173)

Objectives: This study evaluates the feasibility and clinical outcomes of treating acute or subacute odontogenic maxillary sinusitis using sinus irrigation through an extraction socket following the extraction of the causative tooth or implant.

Materials and Methods: This retrospective case series included patients over 19 years old with acute or subacute odontogenic maxillary sinusitis who underwent maxillary sinus lavage through the extraction socket to resolve non-chronic odontogenic maxillary sinusitis. Exclusion criteria were previous sinus surgery, bilateral disease, or maxillary sinus pathology unrelated to dental origin. The treatment involved extracting the causative tooth or implant, intentionally perforating the sinus through the extraction socket with a 19-gauge needle, and performing sinus irrigation with saline. Antibiotic therapy was administered based on culture and sensitivity results.

Results: Seven patients were included. Following the removal of causative teeth or implants, the average number of sinus irrigation sessions via the extraction socket required to resolve symptoms was 2.7±1.3. Saline irrigation combined with appropriate antibiotic treatment led to symptom resolution.

Conclusion: Treating non-chronic odontogenic maxillary sinusitis through sinus irrigation via the extraction site, combined with appropriate antibiotic therapy, was effective in resolving symptoms and avoiding additional surgeries.

Key words: Odontogenic maxillary sinusitis, Sinus irrigation, Extraction socket, Antibiotic therapy

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I. Introduction

Maxillary sinusitis can be caused by environmental allergens, irritants, bacterial infections, fungi, inflammation,

or dental issues involving foreign bodies¹. Acute maxillary sinusitis is defined as symptoms lasting ≤4 weeks, whereas cases 4-12 weeks in duration are termed subacute. Approximately 50% of odontogenic sinusitis cases have a history of dental surgery or infection. According to Maillet et al.², iatrogenic causes account for 65.7% of odontogenic maxillary sinusitis cases; periapical lesions, 25.1%; and chronic periodontitis, 8.3%³. Anatomically, the teeth most commonly affected are, in descending order, the first molar, second molar, third molar, and second premolar. Although the clinical presentation of odontogenic sinusitis varies, it often begins with drainage impairment due to mucosal edema, leading to sinus infections associated with various microorganisms³. Symptoms may include facial pain or pressure, post-nasal drip, nasal congestion, unilateral purulent anterior nasal discharge, and foul odor.

Radiographic imaging is essential for diagnosing and treating odontogenic sinusitis. Plane radiography can miss over 60% of pathologies compared to three-dimensional cone beam computed tomography (CBCT), making CBCT the op-

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timal standard for sinus evaluation when maxillary sinusitis is suspected⁴. In radiographic examinations of odontogenic sinusitis patients, unilateral maxillary sinusitis is most commonly observed, with over 70% of CBCT scans showing unilateral maxillary sinusitis attributable to odontogenic infections^{5,6}. Odontogenic sinusitis significantly differs from non-odontogenic sinusitis in terms of microbiology, often involving a mixed infection of aerobic and anaerobic bacteria^{7,8}.

The typical management sequence is initial antibiotic therapy followed by definitive resolution of the dental focus (e.g., endodontic therapy or extraction) to address the underlying cause⁹. In particular, for acute cases without prior endodontic treatment, root canal therapy followed by antibiotics is typically the first-line approach. If ostial obstruction persists due to edema of the sinus ostium, functional endoscopic sinus surgery (FESS) may be considered to restore patency for better drainage within the sinus¹⁰. However, FESS may impose additional surgical burdens on the patient. The rationale for FESS is to emphasize the patency of the natural ostium, remove introduced foreign materials, and address structural issues to promote better drainage⁷. Since odontogenic sinusitis often does not involve complete loss of maxillary sinus natural ostium function, resolving dental pathology while providing drainage for bacterial infection sites within the maxillary sinus might resolve odontogenic sinusitis without additional surgical interventions such as FESS. The objective of this case series is to evaluate the feasibility of maxillary sinus irrigation through the extraction socket in acute or subacute odontogenic sinusitis and to explore its potential as an alternative therapeutic approach.

II. Materials and Methods

This retrospective case series study was conducted in accordance with ethical regulations under the Helsinki Declaration and approved by the Institutional Review Board (IRB) Committee of Seoul National University Bundang Hospital (IRB No. B-2408-917-102). The study focused on patients diagnosed with acute or subacute odontogenic maxillary sinusitis at the Department of Oral and Maxillofacial Surgery, Seoul National University Bundang Hospital from February 2019 to November 2023. Inclusion criteria: (1) patients who underwent maxillary sinus lavage through the extraction socket to resolve maxillary sinusitis, (2) patients over 19 years of age, (3) patients without previous maxillary sinusitis-related treatment or pathological problems, (4) patients who had received dental treatment within 3 months or had a dental lesion connecting to the maxillary sinus, (5) extraction of teeth judged non-restorable due to a poor prognosis following endodontic or periodontal therapy. Exclusion criteria: (1) patients who underwent maxillary sinus-related treatment at an otolaryngology department, (2) patients with bilateral maxillary sinusitis on CBCT, (3) patients who underwent FESS surgery or opened lateral walls of the maxillary sinus to treat dental sinusitis, and (4) patients with a history of maxillary sinus tumor or trauma.

Surgical removal of the suspected causative lesions or teeth, including implants, was performed based on CBCT. Simultaneously, the maxillary sinus was intentionally perforated through the surgical site using a 19-gauge needle to facilitate drainage of the sinus into the oral cavity.(Fig. 1) The sinus was then irrigated with saline through the drainage route. During saline irrigation, patients were instructed to make an “Ah” sound to prevent the risk of aspiration pneumonia. All patients received empiric antibiotic therapy imme-

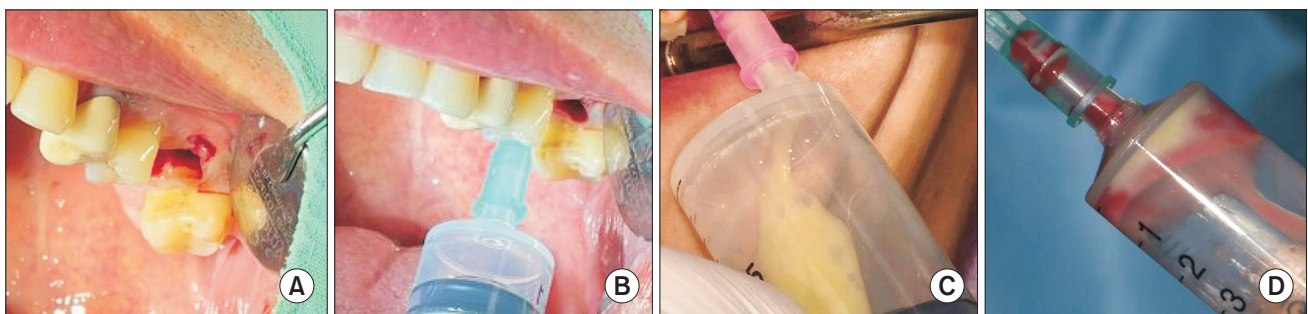


Fig. 1. Case treated through sinus irrigation via extraction site. A. Extraction of the left maxillary first molar, the source of odontogenic sinusitis. B. Perforation of the maxillary sinus mucosa through the extraction site for irrigation. C, D. Pus discharge during aspiration.

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diately post-extraction.

Maxillary sinus irrigation was performed at intervals of 3 days to 2 weeks, depending on patient cooperation and the amount of discharge. Microbial culture and antibiotic sensitivity tests were conducted, and appropriate antibiotic therapy was administered. If pus discharge, clinical symptoms, and maxillary sinusitis signs on radiographs had resolved, dental treatment was terminated. If symptoms recurred, consultation with an otolaryngologist was needed.

III. Results

A total of 7 patients (5 males, 2 females, mean age

52.6±16.6 years) were included in the study.(Table 1) After removing the odontogenic cause, the median number of irrigation sessions was 3 (interquartile range 2-4) via an intraoral approach, which alleviated the symptoms of maxillary sinusitis. For sinus irrigation, the 7 patients had teeth or implants removed and underwent sinus irrigation through the extraction socket using a 19-gauge needle under local anesthesia. No cases of postoperative oroantral fistula formation were observed.

A 36-year-old male patient was referred from the otolaryngology department to identify odontogenic infection before sinus surgery. On initial examination, there was pain and gingival swelling on percussion of tooth #26, and radiographs

Table 1. Demographic and clinical information

Patient No.	Age (yr)	Sex	Origin/radiographic finding	Treatment method	No. of intraoral irrigations	Pus culture result	Medication	Ear, nose, and throat specialist treatment after dental treatment
1	36	M	#26 periapical lesion, Lt maxillary sinus radiolucency	Maxillary sinus irrigation via extraction socket after extraction of the origin teeth	3	Moderate - <i>Viridans streptococcus</i> group A few - <i>Candida albicans</i> Rare - <i>Staphylococcus aureus</i>	Cephalexin, ciprofloxacin	-
2	45	F	#16 periapical lesion, Rt maxillary sinus radiolucency, Obstruction of the natural ostium	Maxillary sinus irrigation via extraction socket after extraction of the origin teeth	4	Moderate - <i>Viridans streptococcus</i> group	Yucla, Fullgram, Augmentin	-
3	47	M	#17 periapical lesion, Rt maxillary sinus radiolucency, Obstruction of the natural ostium	Maxillary sinus irrigation via extraction socket after extraction of the origin teeth	3	-	Clarithromycin	-
4	62	M	#26 periapical lesion, Lt maxillary sinus radiolucency, Obstruction of the natural ostium	Maxillary sinus irrigation via extraction socket after extraction of the origin teeth	2	-	Roxithromycin, Cefpodoxime	Functional endoscopic sinus surgery for the purpose of preventing recurrence
5	64	M	#15i,16i peri-implantitis, Rt maxillary sinus radiolucency, Obstruction of the natural ostium	Maxillary sinus irrigation via extraction socket after extraction of the origin implant	4	-	Cefdinir	-
6	60	M	#16 periapical lesion, Rt maxillary sinus radiolucency	Maxillary sinus irrigation after extracting the origin teeth and intentionally perforating the maxillary sinus	1	-	Amoxicillin/clavulanate, celecoxib, misoprostol	-
7	54	F	#27 periapical lesion, Lt maxillary sinus radiolucency, Obstruction of the natural ostium	Maxillary sinus irrigation after extracting the origin teeth and intentionally perforating the maxillary sinus	2	-	Misoprostol, clarithromycin, Amoxicillin/clavulanate	-

(Lt: left, Rt: right, -: not available)

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Fig. 2. Diagnosis of left maxillary sinusitis due to periapical lesion of the left maxillary first molar. The left maxillary sinus shows radiolucency with extension into the ethmoid sinus.

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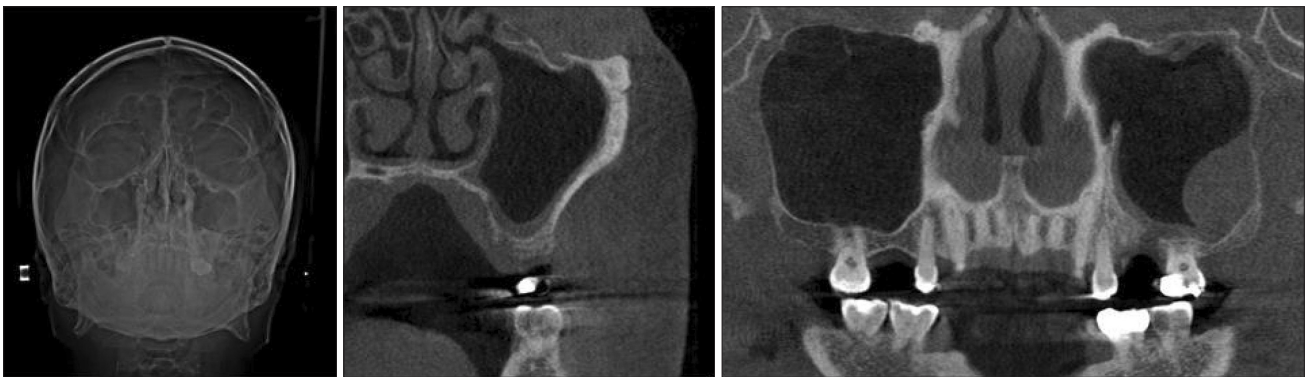


Fig. 3. Radiograph 1 month after extraction of #26. The radiolucency in the left maxillary sinus has nearly resolved.

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revealed radiolucency in the left maxillary sinus with a periapical lesion at the #26.(Fig. 2)

Under local anesthesia, #26 was extracted, and a 19-gauge needle was intentionally inserted through the extraction site to create an oral-maxillary sinus communication, resulting in discharge of a large amount of pus. Microbial culture and antibiotic sensitivity tests were performed, and saline irrigation was performed through the extraction site. Postoperatively, cephalexin 1 g bid was prescribed for 5 days. Microbial culture revealed the presence of *Viridans streptococcus*, *Candida albicans*, and *Staphylococcus aureus*. Antibiotic sensitivity test showed resistance to penicillin; ciprofloxacin 500 mg bid was prescribed for 7 days. Subsequent irrigations were performed every 2 weeks with a 19-gauge needle, and the amount of pus significantly decreased. CBCT showed complete resolution of left maxillary sinusitis, and treatment was concluded with the cancellation of planned otolaryngology surgery.(Fig. 3)

IV. Discussion

This study involved using initial radiographs, CT, additional Water's views, and CBCT to identify origin teeth in odontogenic maxillary sinusitis. We assumed that in cases of non-chronic odontogenic maxillary sinusitis with no previous history of sinusitis, natural ostium function would be normal, and we confirmed that saline was irrigated through the nose in all patients during extraction site-based sinus irrigation. When needed, microbial cultures and antibiotic sensitivity tests were performed. Seven patients underwent sinus irrigation through perforation of the maxillary sinus via the extraction or implant removal sites. Active maxillary sinus irrigations were performed on average 2.7 times per patient, and all treatments were concluded after a decrease in radiolucency in the maxillary sinus on CT and clinical symptom relief.

A literature review of 43 patients with odontogenic maxillary sinusitis indicated that 52% improved with medication and dental treatment, while 48% required FESS. Among

these, 14% required both dental treatment and FESS¹. Kim et al.¹⁰ found that 79% of 19 patients with odontogenic sinusitis after implant surgery required FESS. Wang et al.¹¹ reported that 33% of patients with odontogenic sinusitis required only FESS, while another 33% needed both FESS and dental surgery. Although many patients were successfully managed with FESS alone, the authors acknowledged that dental surgery should be the primary surgical treatment¹². For odontogenic maxillary sinusitis, removing the origin tooth or implant and intentionally perforating the maxillary sinus followed by sinus irrigation through the extraction site can be useful. Additionally, a drainage tube can be inserted into the maxillary sinus and fixed with sutures to surrounding tissues. However, because the formation of an oroantral fistula is a significant risk with an oral drainage tube, the authors opted to use repeated irrigation with a syringe, and no cases of oroantral fistula were observed. During sinus irrigation, since impurities can be discharged through the patient's nose and may pass into the throat, irrigation should be performed with the patient in an upright position and pus pan under the chin to collect the discharge.

The causative microorganisms of odontogenic maxillary sinusitis are distinct from those of non-odontogenic sinusitis¹³. Odontogenic maxillary sinusitis involves mixed anaerobic organisms, such as *Petostreptococcus*, *Prevotella*, and *Fusobacterium*, which differ from non-odontogenic sinusitis. Common fungal infections include non-invasive *Aspergillus mycetoma*^{1,13}. Excessive expansion of endodontic sealers beyond the apical foramen can be a major pathophysiological factor for maxillary sinus infections in healthy patients⁸. Antibiotic susceptibility profiles demonstrate highest efficacy for piperacillin (93.9%) and ampicillin (80%) when paired with β -lactamase inhibitors, followed by cefotaxime (78%), cefuroxime (69%), and clindamycin (50%)^{12,14,15}. Amoxicillin is considered a suitable first therapy for most acute maxillary sinusitis patients¹⁶, with comparable outcomes reported for amoxicillin-clavulanate versus cephalosporins or macrolides⁴. Broader anaerobic coverage is recommended using β -lactamase inhibitors (amoxicillin/clavulanate) or clindamycin, and metronidazole in combination⁷. In addition, agents such as levofloxacin, tetracyclines, or moxifloxacin may be considered in refractory cases¹⁷⁻²⁰. Optimal treatment duration is at least 14 days or a minimum of 7 days beyond symptom resolution; some studies advocate for up to 28 days of therapy^{17,21}. Despite this, antibiotic monotherapy often proves insufficient for odontogenic maxillary sinusitis^{12,22}. In this study, microbial culture predominantly identified *Viridans*

streptococcus. In Case 2, despite the lack of specific antibiotics, aggressive maxillary sinus irrigation alone led to symptom resolution, suggesting that direct mechanical lavage may outperform systemic antibiotic therapy alone.

In the 2024 expert consensus on odontogenic infections, although nasal procedures such as FESS may accompany tooth extraction, no dental surgical interventions were recommended in cases of maxillary sinusitis¹². Using the post-extraction socket for direct sinus irrigation prior to endonasal surgery may offer a less invasive and effective therapeutic alternative. A limitation of this study is that the condition of the maxillary sinus ostium or sinus function before the onset of maxillary sinusitis could not be assessed due to the characteristics of the study participants and the limited number of patients included in this study. However, since all patients had saline injections through the extraction site confirmed to flow through the sinus ostium, it can be inferred that the patency of the sinus ostium was maintained. Additionally, the reduction in the volume of discharge with repeated irrigation through the extraction site suggests that this method may reduce the need for additional radiographic examinations, providing effective treatment with reduced burden on the patient. If saline injection through the extraction site does not lead to irrigation or improvement in drainage after 2-3 irrigations, further examination of other causes beyond odontogenic factors and collaboration with otolaryngology should be considered.

V. Conclusion

In cases of non-chronic odontogenic maxillary sinusitis, treatment involving the removal of the odontogenic cause and sinus irrigation through the extraction site, followed by appropriate antibiotic therapy, resulted in successful outcomes.

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Authors' Contributions

J.Y.K. participated in data collection and writing the manuscript. J.Y.K., P.Y.Y., and J.K.K. participated in the study design and performed the statistical analysis. J.K.K. participated in the study design and coordination and helped to draft the manuscript. All authors read and approved the final manu-

script.

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Ethics Approval and Consent to Participate

This study was approved by the Institutional Review Board (IRB) of Seoul National University Bundang Hospital (IRB No. B-2408-917-102), and was conducted according to the principles of the Declaration of Helsinki for research on humans. Informed consent was not applicable for the case series study because images did not contain patient-specific information.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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