# Clinical Challenges of Maxillofacial Postoperative Infections: A Case Report of Maxillary Abscess and Review of Posttraumatic Sinusitis Literature

Iwan Setiawan Adji[1*]

[1]Ear, Nose, Throat, Head and Neck Surgery Department, Faculty of Medicine, University of Muhammadiyah Surakarta, Sukoharjo 57169, Central Java, Indonesia

*Corresponding author

**Abstract**

Maxillofacial postoperative infections, particularly chronic sinusitis and maxillary abscess, are frequent but often overlooked complications, especially in the young. Factors such as postoperative anatomical disturbances, sinus ostium obstruction, and smoking contribute to impaired mucociliary drainage and the development of secondary infections. This study aims to highlight appropriate diagnostic and therapeutic approaches while providing deeper insights into the relationship between postoperative sinusitis and maxillary abscesses in young patients. Literature review was conducted through a systematic search in PubMed, Google Scholar, Wiley, and Springer within the last 10 years. The literature suggests that postoperative trauma, metal implants, and host factors such as smoking may increase the risk of chronic sinusitis and abscess. We report a 19-year-old man with complaints of pain and swelling of the left cheek that lasted for two months. The patient had a history of two maxillary surgeries and was an active smoker. CT-scan examination showed maxillary sinusitis sinistra with air bubble and suspected abscess. The diagnosis was made as maxillary abscess due to chronic sinusitis based on histopathology results. Management was conservative with broad-spectrum antibiotics, anti-inflammatory, and supportive. Conservative management is effective in the majority of cases, although surgical intervention may be required in refractory cases. Postoperative maxillary abscesses need to be identified early through imaging and thorough evaluation. Timely conservative therapy can prevent further complications.

**Keywords**: Maxillary Abscess, Chronic Sinusitis, Maxillary Surgery, Maxillary Sinus, Odontogenic Infection.

## INTRODUCTION

Odontogenic infection is an oral cavity infection caused by dental caries and periodontal disease, which can spread to adjacent tissues, including the face, jaw, and neck (Hoerter & Malkin, 2023; Djody et al., 2024). Maxillofacial abscesses often result from periapical or periodontal infections of the incisors, canines, or molars, with periapical infection being the most common source of odontogenic infection compared to periodontal origins (Djody et al., 2024). Dental abscesses or periapical infections generally arise from advanced caries, trauma, or failed root canal treatment. If left untreated, these infections may cause severe pain and spread into deep neck spaces or intracranial sinuses (Yousefi et al., 2023). Other potential complications include airway obstruction, mediastinitis, necrotizing fasciitis, cavernous sinus thrombosis, sepsis, thoracic empyema, Lemierre's syndrome, cerebral abscess, orbital abscess, and osteomyelitis (Bali et al., 2015; Neal & Schlieve, 2022). Odontogenic infections during pregnancy may also endanger both the fetus and the mother (Jain et al., 2024).

The pathogenesis of maxillary abscess involves bacterial invasion of soft tissues, triggering acute inflammation, tissue necrosis, pus formation, and an immune response that leads to fibrotic capsule formation to contain the infection (Sumeja, 2017). Clinically, patients with maxillary abscess may present with severe pain, facial swelling, neck enlargement, trismus, pus discharge from the oral or nasal cavity, systemic toxicity, and dysphagia (Laskar et al., 2015; Aliabadi et al., 2021; Hoerter & Malkin, 2023; Djody et al., 2024). Altered mental status and dyspnea are warning signs of a life-threatening condition requiring urgent management. Oral examination typically reveals infected teeth with discoloration, enamel destruction, and surrounding gingival erythema and swelling (Neves et al., 2019). Diagnosis is based on a combination of patient history, physical examination, radiological evaluation such as CT scan or orthopantomogram (OPG), and microbiological testing (Aliabadi et al., 2021).

Approximately 70-80% of maxillary abscess cases are odontogenic in origin, usually caused by advanced dental caries, pulp infection, or periodontitis (Djody et al., 2024). However, several non-odontogenic risk factors also play an important role, including facial trauma, history of maxillofacial surgery, immunosuppression, smoking habits, and systemic diseases such as diabetes (FDI World Dental Federation, 2017). Moreover, maxillary abscesses may arise as complications of sinusitis, particularly following trauma or maxillary surgery (Sakkas et al., 2023).

Postoperative sinusitis following maxillary fracture surgery is a relatively common complication and may progress into an abscess if left untreated (Jiang et al., 2022). Surgical procedures in the maxillary region may lead to obstruction of the sinus ostium due to hematosinus, mucosal edema, or the presence of implants such as plates and screws that penetrate the sinus cavity (Sakkas et al., 2023; Chaves et al., 2022). Studies have reported an incidence of postoperative sinusitis ranging from 10% to 30%, with the highest prevalence observed in Le Fort II and III fractures involving the lateral wall and orbital floor (Kim et al., 2022). The pathophysiology of postoperative sinusitis is associated with impaired mucociliary clearance and mucus drainage, resulting in secretion retention and colonization by pathogenic bacteria. If untreated, this may progress to secondary infections, including maxillary abscess formation (Orpa et al., 2021). Additionally, smoking exacerbates mucociliary dysfunction and increases the risk of chronic inflammation in the sinus cavity (Reh et al., 2012; Utiyama et al., 2016).

This case report presents a 19-year-old male with a two-month history of pain and swelling in the left cheek. CT scan findings revealed left maxillary sinusitis with mucosal thickening and a suspected abscess. Histopathological examination confirmed chronic sinusitis, leading to the diagnosis of a left maxillary abscess. The patient's history of maxillary surgery and smoking habit were important risk factors in disease progression. This case emphasizes the importance of thorough evaluation in patients with a history of maxillary surgery and persistent or worsening sinusitis symptoms. By combining case analysis with a literature review, this report aims to highlight appropriate diagnostic and therapeutic approaches while providing deeper insights into the relationship between postoperative sinusitis and maxillary abscesses in young patients.

## MATERIALS AND METHODS

### Case Report

A 19-year-old male patient presented to the ENT outpatient clinic at Karanganyar General Hospital with the chief complaints of pain and swelling in the left cheek that had persisted for the past two months. The pain in the left cheek was continuous, and the swelling did not decrease. The patient reported a marble-sized lump in the left cheek that was movable and non-tender. He also complained of a runny nose for one week prior to hospital admission, accompanied by nasal discharge from both nostrils and bilateral nasal obstruction. The nasal discharge and obstruction were constant, improving during sleep and after taking medication,

but worsening after consuming cold drinks. The patient denied tinnitus, ear discharge, or ear pain associated with nasal obstruction.

There was no sore throat during swallowing; however, the patient's mouth opening was limited to a maximum of two finger breadths due to pain on opening. The complaints were accompanied by dental caries (+) in the right upper molar for the past two years and pain (+) in the right lower molar and left upper molar. Nausea and vomiting were denied. The patient had a history of left maxillary surgery at Dr. Moewardi General Hospital (RSDM) in 2022 and right maxillary ROI surgery in 2023 at PKU Karanganyar. Smoking history was positive.

**Diagnosis**

An ENT examination of the nasal cavity and anterior rhinoscopy revealed hyperemia (+/+), nasal discharge (+/+), hypertrophy of the turbinates (+/+), and no deformity (-/-). On palpation, there was no tenderness over the nose (-) and no tenderness over the maxillary sinus (-). Facial inspection showed swelling of the left cheek (+). Palpation revealed a movable, non-tender mass (+).

A supporting investigation in the form of a CT scan was performed. The paranasal sinus CT scan showed mucosal thickening in the maxillary sinus with lucent air bubbles inside, extending into the left ethmoid sinus, left frontal sinus, and part of the left nasal cavity (suggestive of sinusitis). The findings also suggested a possible abscess, with a differential diagnosis of left sinonasal mass and left maxillary sinusitis. Histopathological examination of a small tissue specimen concluded chronic sinusitis in the left maxilla. Based on these findings, the patient was diagnosed with a left maxillary abscess.


**Figure 1A.** (Ostium of maxillary sinus)


**Figure 1B.** (Media antrostomy performed using the Bacn Bitter tool)

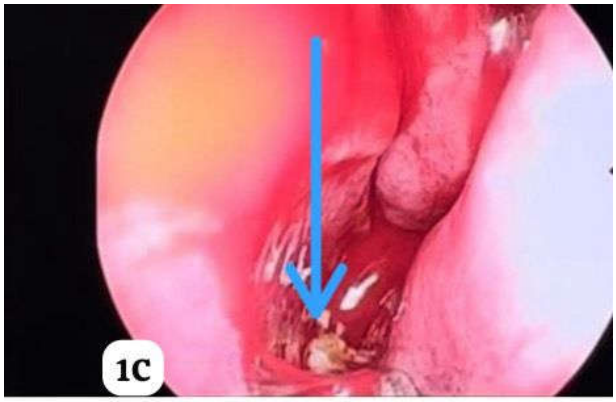



**Figure 1C.** (Fungal Ball Found)

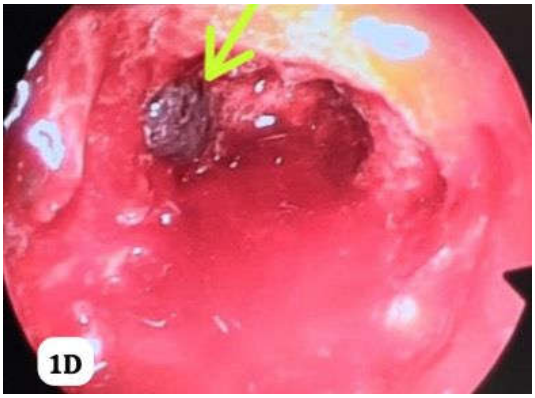



**Figure 1D.** (Yellow: mucosa of maxillary sinus fron calf well luc view)

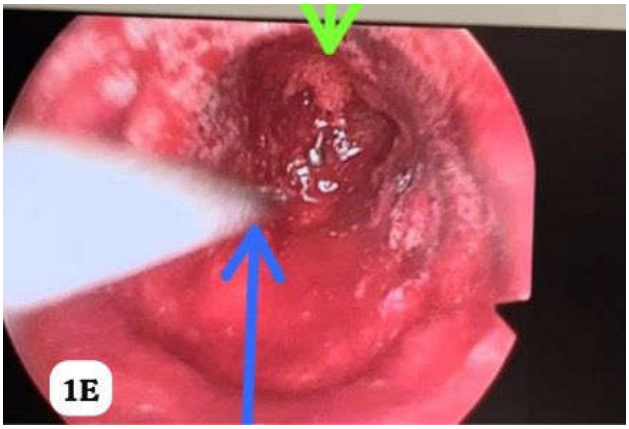
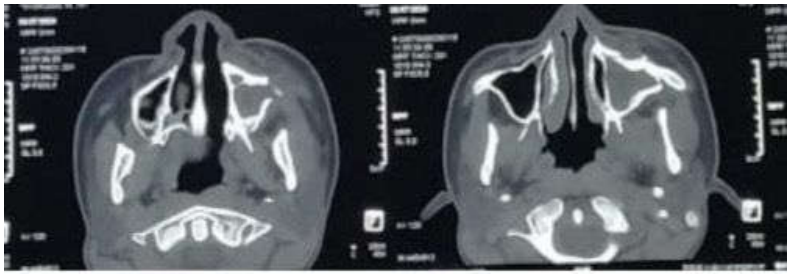



**Figure 1E.** (Green Arrow: Ostium seeks from nasal cavity; Blue Arrow: Nasal suction forms cald well luc access)



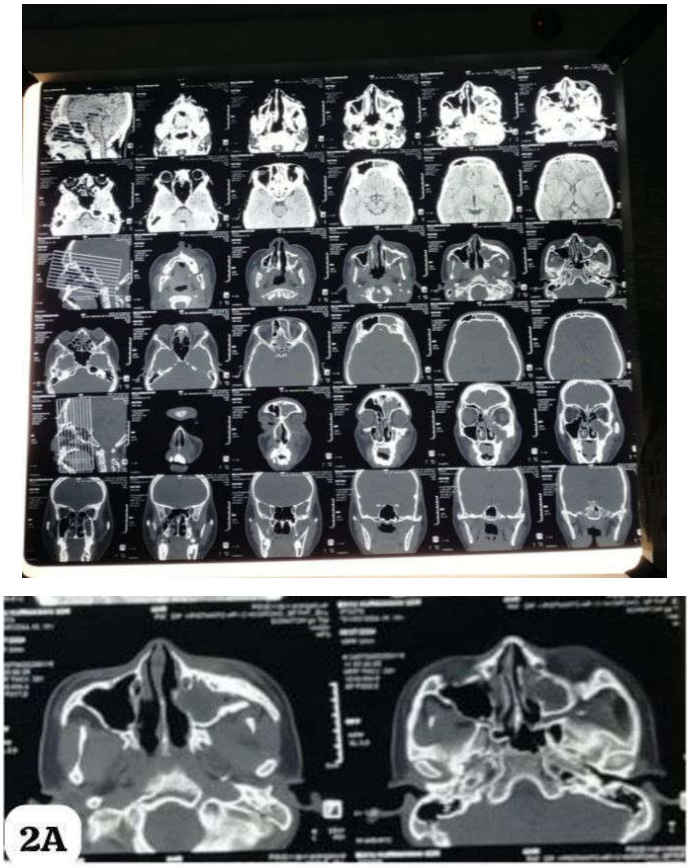



**Figure 2A.** CT Scan Showing Left Maxillary Sinus Opacification Suggestive of Chronic Sinusitis and Abscess

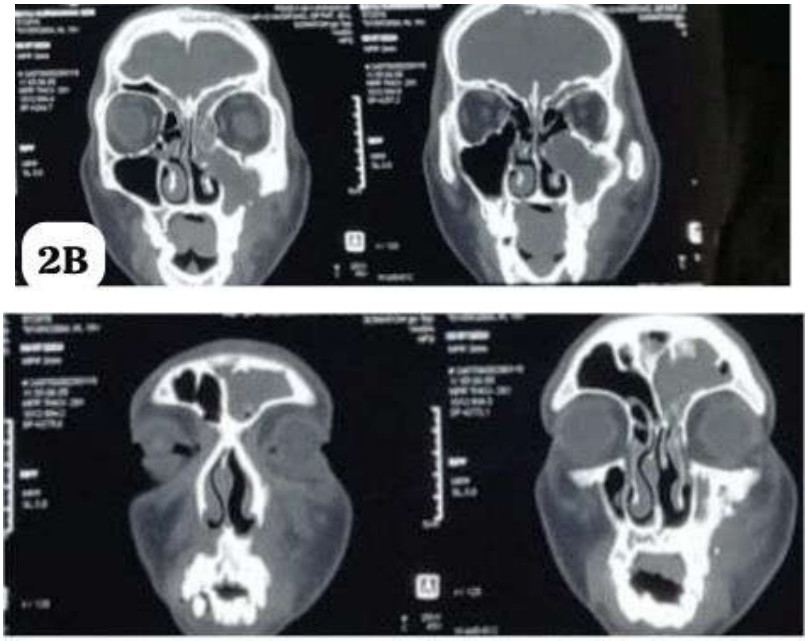



**Figure 2B.** CT Scan Showing Rightt Maxillary Sinus Opacification Suggestive of Chronic Sinusitis and Abscess

## RESULTS AND DISCUSSION

In order to provide support for the clinical findings in this case, Table 1 presents a summary of the main literature that highlights the mechanisms and risk factors associated with maxillary sinusitis due to trauma and maxillofacial surgery. The table contains 16 recent international publications that include various study designs from case reports to systematic reviews, which all together point out the involvement of facial trauma, odontogenic infections, and surgical interventions (including the placement of metal implants) in the disruption of mucociliary function and obstruction of the sinus ostium. These studies stress that anatomical changes after surgery are one of the main reasons for secretion retention and secondary infections, thus confirming the clinical picture of the current case.

**Table 1.** Summary of Literature on Maxillary Sinusitis Risk Following Maxillofacial Trauma and Surgical Procedures.

| No. | Journal Title | Authors / Year / Country | Journal Type | Research Objective | Method | Findings | Mechanism of Sinusitis Risk in Maxillary Fractures |
|---|---|---|---|---|---|---|---|
| 1 | Characteristics and risk factors in odontogenic maxillary sinusitis from different dental infections: a retrospective study based on sinus CT imaging | Zhao et al. / 2025 / China | Retrospective Study | To evaluate dental infections as causes of sinusitis | 968 patients, 261 odontogenic sinusitis cases | Dental infection accounted for 26.96% of maxillary sinusitis cases. | Lesions close to sinus floor (<3.32 mm) → rapid infection spread into sinus. |
| 2 | Treatment of Odontogenic Maxillary Sinusitis with the Use of Growth Factors in Advanced Platelet-Rich Fibrin for Immediate Closure of Oro-Antral Communication: A Case Report | Adamska et al. / 2024 / Poland | Case Report | To evaluate A-PRF in healing OAC and odontogenic sinusitis | Patient with post-extraction sinusitis | Rapid healing, OAC closure without complications. | Open pathway (OAC) → sinus contamination → infection. |
| 3 | Maxillary Sinusitis Following Orthognathic Surgery: Should It Be Considered Odontogenic Sinusitis? | Imbrogno et al. / 2024 / Italy–USA | Case Report | To assess whether post–Le Fort sinusitis can be classified as odontogenic sinusitis | Case report of a 58-year-old female, clinical and endoscopic evaluation | Sinusitis occurred 23 years after surgery, caused by retained titanium plate and fungal/bacterial infection. | Plates and screws induced chronic inflammation, fungal ball formation, and long-term sinus obstruction. |
| 4 | Sinus irrigation as an adjunctive therapy for odontogenic maxillary sinusitis—an in-depth analysis | Jaiswal et al. / 2024 / South Korea | Retrospective Study | To evaluate benefits of intraoral sinus irrigation | 21 patients, CBCT volumetric analysis | Sinus opacity volume reduced by 40%, clinical symptoms | Oroantral fistula from dental procedures → sinus contamination. |

| No. | Journal Title | Authors / Year / Country | Journal Type | Research Objective | Method | Findings | Mechanism of Sinusitis Risk in Maxillary Fractures |
|---|---|---|---|---|---|---|---|
| | | | | | | improved. | |
| 5 | The Incidence of Maxillofacial Trauma Post ORIF on The Incidence of Chronic Sinusitis | Salsabila et al. / 2024 / Indonesia | Case Report | To evaluate sinusitis after maxillary trauma | 4 post-ORIF trauma patients | Risk of ostium obstruction and sinusitis occurred post-ORIF. | Plates, hematosinus, mucosal trauma → secondary sinus infection. |
| 6 | Application of N-Butyl-2-Cyanoacrylate for the Treatment of Comminuted Fractures in the Anterior Wall of the Maxillary Sinus: A Prospective Clinical Study | Hafeez et al. / 2023 / India | Prospective Study | To assess clinical outcomes of bone glue in sinus fractures | 10 patients, 6-month follow-up | 70% had favorable outcomes without local complications. | Bone fragments → sinus obstruction if not stabilized adequately. |
| 7 | Relationship between midfacial fractures and maxillary sinus pathology | Kim et al. / 2023 / South Korea | Retrospective Study | To evaluate the incidence of sinus pathology after ORIF | 275 patients, CT scan evaluation and statistical analysis | 11.27% of patients developed sinusitis, mainly in orbital blowout fractures. | Orbital fractures → mucosal disruption → secretion accumulation and infection. |
| 8 | Endoscopic perspective in oral and maxillofacial surgery | Pendharkar / 2023 / India | Narrative Review | To explain the benefits of endoscopic technology in OMFS | Literature review | Endoscopy provides superior visualization and high accuracy. | Visualization reduces risk of mucosal trauma and ostium obstruction. |
| 9 | How to Avoid Complications in Maxillary Sinus Elevation | Testori et al. / 2023 / Italy–USA | Clinical Review | To provide strategies for preventing sinus lift complications | Literature review and clinical experience | CBCT is essential for anatomical assessment prior to procedure. | Sinus membrane perforation → sinusitis if undetected early. |
| 10 | Risk factors for maxillary sinus pathology after surgery for midfacial fracture: a multivariate analysis | Jiang et al. / 2022 / China | Retrospective Study + PSM | To identify risk factors for sinusitis after ORIF | 262 patients, CT + regression analysis | 58.6% developed sinus pathology; screw penetration posed the greatest risk. | Screws penetrating the sinus and multiple fractures → mucosal irritation and secretion retention. |
| 11 | Maxillary sinusitis developed as sequelae of accidental middle turbinectomy that occurred during nasotracheal intubation: a case report | Kim et al. / 2021 / South Korea | Case Report | To report sinusitis complication due to intubation trauma | 19-year-old male, 2-year follow-up | Sinusitis developed 2 years after turbinate injury during intubation. | Turbinate avulsion → synechiae and drainage impairment → chronic sinusitis. |
| 12 | Treatment of recalcitrant maxillary sinusitis with endoscopic modified medial maxillectomy: a systematic review of safety and efficacy | Loftus et al. / 2020 / USA | Systematic Review | To assess long-term outcomes of EMMM procedure | 6 studies, 255 patients | Majority had symptom improvement; procedure was safe. | Obstruction from fracture or fibrosis → requires FESS intervention. |
| 13 | Blood collection within | Cox et al. / | Retrosp | To evaluate | 92 patients, | Drains | Absence of drain → |

| No. | Journal Title | Authors / Year / Country | Journal Type | Research Objective | Method | Findings | Mechanism of Sinusitis Risk in Maxillary Fractures |
|---|---|---|---|---|---|---|---|
| | the maxillary sinus following orbital fracture repair: the impact of mesh implants and drains | 2019 / USA | ective Study | impact of mesh and drains | 4 groups | reduced sinus blood collection by 12%. | hematosinus → increased risk of bacterial infection. |
| 14 | Is post orthognathic maxillary sinusitis related to sino-nasal anatomical alterations? | Procacci et al. / 2019 / Italy | Retrosp ective Cohort | To assess relation between sinusitis and post–Le Fort nasal deformity | 64 patients, pre- and post-CBCT | 18.5% developed sinusitis, correlated with deviation and septal perforation. | Post-surgical structural deformities → impaired mucus flow. |
| 15 | Management of acute maxillary sinusitis after sinus bone grafting procedures with simultaneous dental implants placement–a retrospective study | Chirilă et al. / 2016 / Romania | Retrosp ective Study | To evaluate sinusitis following sinus lifting and implant placement | 116 patients, clinical observation | 4.3% of patients developed acute sinusitis, which resolved with antibiotic therapy. | Membrane perforation and graft migration into sinus → inflammation and impaired drainage. |
| 16 | Surgical methods of zygomaticomaxillary complex fracture. Archives of Craniofacial Surgery | Ji et al. / 2016 / South Korea | Retrosp ective Study | To review fixation approaches in ZMC fractures | 502 patients | 72.9% underwent 2-point fixation with stable, favorable outcomes. | Plates/screws near sinus → impaired mucociliary drainage. |

A clinical case of a maxillary abscess in a 19-year-old male with a history of left-sided sinus surgery illustrates how trauma and maxillofacial surgical interventions can lead to serious infectious complications, such as chronic sinusitis and abscess formation. Longchamp et al. (2025) reported that 24.1% of 253 participants who underwent extraoral drainage developed complications, of which 15.8% were major and the remainder were minor. The most common minor complications were hypokalemia and lower limb edema, while the most frequent major complications were persistent and recurrent abscesses. These complications occurred both in the early postoperative phase (1–5 days) and in the late postoperative phase (14–15 days). Another study involving 485 participants recorded 93 cases (19.2%) of complications, including postoperative malocclusion, bleeding, inferior alveolar nerve injury, bad split, and infection. Complications were more common in males ($p = 0.029$), in longer procedures ($p < 0.05$), and in surgeries with multiple interventions ($p = 0.019$). The highest complication rates were observed in mandibular procedures ($p = 0.010$), particularly bilateral sagittal split osteotomy ($p < 0.001$). Most were Clavien-Dindo grade I complications (72.04%) (Zaroni et al., 2019). Lone et al. (2021) also reported mild-to-severe complications,

with frequent occurrences of sore throat, dysphagia, nausea, vomiting, pain, and swelling in patients without comorbidities, while those with comorbidities also developed delayed wound healing, hypertension, and infection. The occurrence of postoperative complications is influenced by various variables. Dignam et al. (2024) categorized these into three groups: tooth-related factors (indications for extraction, extraction complexity and duration, dental arch, number of teeth), patient-related factors (general health status, age, sex, smoking, alcohol consumption, medications, oral hygiene), and clinician-related factors (level of experience, surgical technique, anesthesia, chlorhexidine mouthwash, and analgesics).

The patient's primary complaints included left cheek pain and swelling, limited mouth opening, and a history of carious molar teeth, which highlight the strong association between odontogenic infection, post-surgical anatomic alterations, and impaired sinus drainage leading to pus accumulation. Maxillary fractures, particularly Le Fort II and III, often directly involve the maxillary sinus (Chung et al., 2019; Meldrum et al., 2023; Lenkeit et al., 2025). Disruption of the mucociliary system and sinus ostium obstruction are key mechanisms in the pathophysiology of post-traumatic or postoperative sinusitis. Infection can induce mucosal edema, narrowing the sinus ostium and causing mechanical obstruction. This blockage leads to secretion retention, creating an environment conducive to bacterial and fungal growth (Sharma et al., 2024). If uncontrolled, the infection may extend into adjacent soft tissue, resulting in abscess formation, as demonstrated in this case report.

Damaged anatomical structures and postoperative metallic implants further exacerbate the condition. The patient's CT scan revealed mucosal thickening and the presence of air bubbles in the left maxillary sinus extending to the ethmoid and frontal sinuses, suggestive of abscess or sinonasal mass. These findings align with literature reports that postoperative obstruction of sinus drainage pathways predisposes to secretion accumulation and secondary infection. Furthermore, cases of retained titanium plates following surgery have been associated with sinusitis (Fischer et al., 2023; Imbrogno et al., 2024; Kwon et al., 2025). Histopathological evidence of chronic sinusitis further supported the presence of long-standing inflammation requiring continued clinical attention.

Several studies, including Jiang et al. (2022) and Kim et al. (2023), have shown that the placement of fixation screws or plates penetrating the sinus cavity during ORIF can trigger mucosal inflammation and alter sinus secretion flow. Similarly, retained foreign bodies such as titanium plates may provoke a chronic immune response and serve as a nidus for pathogenic microorganisms, including bacteria and fungi (Imbrogno et al., 2024). This explains why the patient in this case was at high risk of recurrent complications. Management

was carried out conservatively with broad-spectrum antibiotics (Ceftriaxone and Metronidazole), analgesics, corticosteroids, and gastric protection. Antibiotics and supportive therapy represent the first-line approach, especially in surgical cases, to prevent further spread of established infection (Berry, 2018). However, in certain circumstances, procedures such as Functional Endoscopic Sinus Surgery (FESS) may be required. The goals of FESS in managing sinusitis are to enlarge the sinus ostia, restore adequate aeration, improve mucociliary clearance, and provide an improved route for topical therapy (Homsi & Gaffey, 2022).

In addition to anatomical and technical factors, host conditions such as smoking also play a significant role in impairing mucociliary function and delaying healing. Individuals with a history of smoking have an increased risk of chronic respiratory infections, including sinusitis (Chen et al., 2025). Gill et al. (2023) found that patients with chronic rhinosinusitis (CRS) were significantly more likely to report a history of tobacco use compared to controls (19.6% vs. 15.0%) ($p < 0.001$). Therefore, patient education to stop smoking and maintain oral and nasal hygiene is integral to long-term preventive strategies. Perioperative management is crucial in preventing postoperative intraoperative sinusitis complications (Valentini & Stacchi, 2025). Preoperative evaluation with CT scans, anatomical mapping of the sinuses, careful selection of fixation techniques with minimal risk, and the use of prophylactic antibiotics should be standard protocols in maxillofacial surgery. Postoperatively, regular clinical and radiological monitoring is essential to detect early sinus opacification or signs of inflammation before progression to abscess or chronic sinusitis.

The integration of clinical case findings with literature evidence emphasizes the importance of a multidisciplinary approach in managing patients with trauma or surgical interventions in the maxillofacial region. Sinusitis and abscess formation are not merely technical complications but rather complex conditions influenced by anatomy, microbiology, patient habits, and the quality of medical intervention. With evidence-based holistic management and adequate patient education, the risk of severe complications can be minimized, ultimately improving patient quality of life.

## CONCLUSION

Maxillary abscess represents a serious complication of infection, frequently originating from undetected or inadequately managed chronic sinusitis, particularly in patients with a history of maxillofacial surgical intervention. Postoperative anatomical alterations, the involvement of implants such as plates and screws, and impaired mucociliary function due to

trauma or smoking habits are major predisposing factors in the pathogenesis of sinusitis and maxillary abscess formation.

The case report of a young patient presented in this study underscores the importance of maintaining clinical vigilance toward persistent postoperative complaints, including facial pain, swelling, and obstructive sinus symptoms. Accurate diagnosis requires a multidisciplinary approach involving comprehensive history taking, physical examination, imaging (CT scan), and histopathological confirmation. Conservative management with broad-spectrum antibiotics, anti-inflammatory agents, and supportive therapy can provide favorable clinical outcomes, particularly when initiated early. However, refractory or recurrent cases necessitate further evaluation for possible surgical intervention, such as functional endoscopic sinus surgery (FESS).

Both literature and clinical evidence consistently highlight that long-term prevention through optimization of surgical techniques, rigorous postoperative monitoring, and modification of risk factors such as smoking are crucial to reducing morbidity associated with sinus complications. With a comprehensive and evidence-based approach, the prognosis of patients at risk of postoperative maxillary abscess can be significantly improved.

**Declaration of Conflict**

There were no disclosed conflicts of interest by the authors.

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