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Research Article

A Case Report On Carcinoma of the Left Maxillary Sinus in an Elderly Patient

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ABSTRACT
Background: Maxillary sinus carcinoma is a relatively rare head and neck cancer malignancy but frequently appears in the advanced setting owing to initially non-specific symptoms. Tumors in this area can extend into the nasal cavity, oral cavity, orbit, and adjacent bony structures, often causing diagnostic and therapeutic difficulties.
Case Presentation: We report the case of an 81-year-old woman who presented with progressive left-sided nasal blockage, episodic epistaxis, and ill-defined left midfacial swelling. MRI and PET-CT scan were found to reveal a heterogeneous soft-tissue mass originating from the left maxillary sinus with intranasal extension and erosions in the multiple bony walls. Histopathological assessment of biopsy tissues revealed a microcystic patterned malignant tumor; immunohistochemistry was recommended for further categorizing the neoplasm to conclusion.
Conclusion: This case highlights the value of a high index of suspicion and thorough diagnostic imaging in the identification of malignant pathologies of the maxillary sinus. Surgical excision with adjunctive therapy is still the cornerstone of treatment, but care needs to be individualized according to tumor type, extent, and patient circumstances. This case contributes to the literature detailing the wide ranging presentations and therapeutic paradigms of maxillary sinus carcinoma, highlighting the importance of multidisciplinary management and early diagnosis.

INTRODUCTION

Paranasal sinus carcinomas as a group are responsible for less than 5% of head and neck cancers, with the most frequent site of involvement in this group being the maxillary sinus, which is responsible for as much as 60–70% of paranasal sinus cancers in certain series [1–3]. While uncommon, tumors of the maxillary sinus represent a great challenge because of their location within the facial bone and their propensity to early invade on adjacent crucial structures like the orbit, palate, and pterygoid plates [4]. Since the maxillary sinus possesses fairly spacious air-filled cavities and is not richly innervated mucosal lining, these tumors can be symptom-free or produce only mild signs (like nasal congestion and obstruction) until advanced stages [5-6]. The majority of patients present with nasal obstruction, epistaxis, facial swelling, or dental symptoms. The early presentation will often mimic benign inflammatory conditions such as sinusitis or dental abscesses, causing delay in diagnosis [7]. As a result, most patients already have locally advanced disease at presentation. Radiologic imaging—such as CT, MRI, and more recently PET-CT—is an important function in defining the extent of the tumor, evaluating for bony invasion, and determining potential lymph node or distant metastases [8]. Histologically, squamous cell carcinoma continues to be the most commonly seen malignant tumor in the maxillary sinus, followed by the small salivary gland carcinomas, adenocarcinomas, adenoid cystic carcinomas, and other less common histologies [9]. Choice of treatment usually includes multimodal management with surgery, radiotherapy, and, in selected patients, chemotherapy 101010. Treatment strategy often is determined by the stage of the tumor, histopathological type, as well as the performance status of the patient. Due to the close proximity of the tumor to vital structures like the orbit and skull base, surgical excision may be technically challenging, with the need for

sophisticated reconstructive methods and/or combined modalities with neurosurgical colleagues if intracranial extension is present [11].

In spite of developments in imaging diagnostics and treatments, the future prognosis of late-stage maxillary sinus carcinoma continues to be guarded with five-year survival rates at 40-60%, with variable stage and histology [12]. Present efforts are placed on risk stratification, advanced surgical techniques refinement, and innovative adjunctive therapy (such as targeted therapy and immunotherapy) potentially enhancing patient outcomes in the years to come [2-3].

In this case report, we outline the clinical presentation, radiologic evaluation, histopathological features, and initial therapeutic options for an 81-year-old woman with carcinoma of the left maxillary sinus. Through detailed imaging (MRI and PET-CT) and histopathologic examination, the case illustrates the intricacy and the need for a multidisciplinary approach for the best possible outcome.

This report endeavors to contribute to the current literature on the diagnostic pitfalls, staging errors, and decision-making models relevant to maxillary sinus carcinoma and emphasize the significance of early detection and intensive management tactics.

Case Presentation

Patient Demographics and Clinical History

An 81-year-old female presented to the otolaryngology clinic with a three-month history of progressive left-sided nasal obstruction, occasional epistaxis, and facial swelling confined to the left midface region. She also reported left-sided cheek pain and intermittent numbness in the upper alveolar region. There was no significant past medical history of note besides controlled hypertension. The patient did not have a history of tobacco usage or occupational exposures (such as wood dust or certain industrial chemicals) that are sometimes implicated in sinus malignancies.

On physical examination, notable findings included a visible swelling over the left side of the face at the region of the maxilla, with mild tenderness on palpation. Anterior rhinoscopy and nasal endoscopy revealed a polypoid mass occupying the left nasal cavity and obstructing visualization of the middle meatus. Gentle probing indicated that the lesion was firm, friable, and prone to contact bleeding. There was no clinically palpable cervical lymphadenopathy at presentation.

Imaging Studies

MRI of Paranasal Sinuses

Magnetic Resonance Imaging (MRI) of the paranasal sinuses was performed, which demonstrated:

- A heterogeneous soft tissue lesion in the left maxillary sinus, displaying T2 hyperintense foci with areas of intermediate intensity.
- The lesion appeared to extend beyond the natural confines of the maxillary sinus, abutting the lateral wall of the nasal cavity and widening the infundibulum.
- Multiple erosions were noted along the medial wall of the maxillary sinus, possibly involving or thinning parts of the bony septations.
- No obvious extension into the orbit was identified, but there was extension toward the inferior turbinate and partial obliteration of the left middle meatus.
- Minimal mucosal thickening in the left ethmoidal and sphenoidal sinuses was also seen, likely due to inflammatory changes or secondary tumor involvement.
- The roof of the nasal cavity appeared normal, and there was no apparent intracranial extension based on the MRI sequences reviewed.

PET-CT Scan

To evaluate for possible metastatic disease and to better characterize the local extent, a PET-CT scan was performed:

- A hypermetabolic mass lesion was demonstrated within the left maxillary sinus, with standardized uptake values (SUVs) suggestive of high metabolic activity.
- The mass extended into the adjacent nasal cavity.
- No significant FDG uptake was noted in the cervical lymph node basins, and no distant hypermetabolic lesions were identified in the thorax, abdomen, or pelvis.
- There was no evidence of bony metastasis or other organ involvement, suggesting the disease was localized primarily to the left maxillary sinus and surrounding structures.

Histopathological Findings

A nasal endoscopic biopsy was performed to determine the histological nature of the lesion:

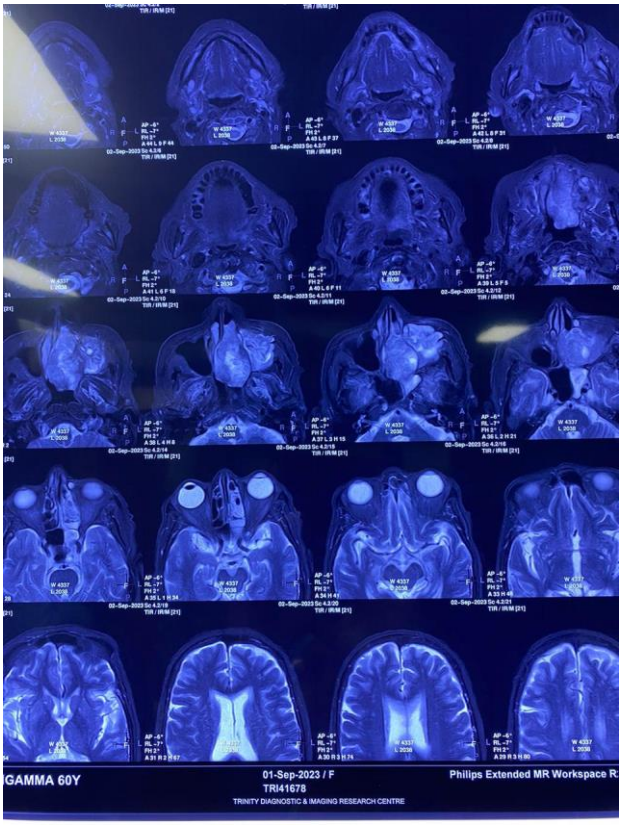
- **Gross Description**: Several irregular bits of tissue, grey-white in color, measuring 3–4 mm in dimension.
- **Microscopic Examination**: Sections revealed multiple fragments of tissue with areas lined by pseudostratified columnar epithelium typical of respiratory mucosa; beneath this lining were neoplastic nests of malignant cells. The tumor exhibited a microcystic pattern, with small cystic spaces between cellular aggregates. Focal necrosis or degenerative changes were observed, but no granulomas or giant cells were identified.
- **Provisional Diagnosis**: Malignant tumor with microcystic features, requiring additional immunohistochemical (IHC) analysis for definitive classification. The morphologic impression included the possibility of a high-grade carcinoma such as squamous cell carcinoma with microcystic changes, or a minor salivary gland carcinoma subtype (including the possibility of adenoid cystic carcinoma).

Given the histological complexity and the microcystic architecture, the pathology team recommended immunohistochemical staining to fully characterize the tumor. Markers such as p40, cytokeratins, S-100, and CD117 (among others) were recommended to identify or rule out specific histologic subtypes.

Clinical Course and Provisional Plan

At the time of writing, the patient was being further evaluated by a multidisciplinary head and neck tumor board, which comprised otolaryngologists, oncologic surgeons, radiation oncologists, pathologists, and radiologists. Given her age and comorbidities, optimal treatment planning necessitated careful assessment of surgical resectability and the patient's fitness for general anesthesia.

- **Surgical Consideration**: If imaging and endoscopic evaluation confirmed resectability without extensive skull-base or orbital invasion, a partial maxillectomy (potentially endoscopic-assisted or open approach) plus negative-margin resection of the involved nasal structures would be recommended.
- **Adjuvant Therapy**: In the event of high-grade features or positive margins, postoperative radiotherapy, with or without chemotherapy, would be advised. For advanced histologies such as adenoid cystic carcinoma, long-term follow-up and consideration for proton-beam therapy or specialized radiation might be warranted.
- **IHC Confirmation**: Definitive diagnosis via immunohistochemistry remains critical for identifying the exact histological subtype and tailoring therapy accordingly. For example, if the tumor represents a minor salivary gland origin (e.g., adenoid cystic carcinoma), it may necessitate more aggressive local control measures and long-term surveillance due to a propensity for perineural invasion.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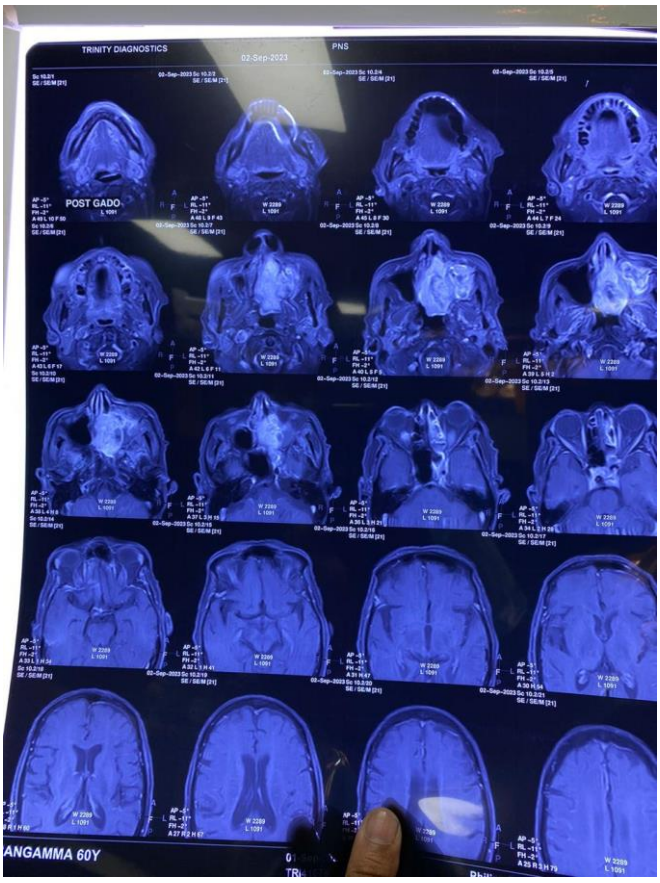
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DISCUSSION

Epidemiology and Incidence

Malignancies of the paranasal sinuses are rare, accounting for approximately 0.2–0.8% of all malignancies [1]. Among these, the maxillary sinus is the most common site, responsible for about 60–70% of cases [2]. Risk factors for maxillary sinus carcinoma historically have included occupational exposures (e.g., woodworking, leather dust, certain chemicals) and, in some studies, chronic sinusitis or tobacco usage [3]. However, many patients, especially older adults, can present without clear etiologic exposures, as in the present case of an 81-year-old female without a significant history of tobacco use or industrial work.

Clinical Presentation and Diagnostic Delay

One of the greatest challenges in treating maxillary sinus carcinoma is that symptoms can be nonspecific and mimic chronic sinusitis or benign nasal polyposis [4]. Common complaints such as nasal obstruction, facial pain, epistaxis, and swelling in the cheek or midfacial region may not initially prompt suspicion for malignancy. Dental symptoms—such as loose teeth or ill-fitting dentures—also occur if the tumor invades the alveolar ridge. Consequently, a significant proportion of patients present in advanced stages (T3–T4), resulting in more complex management and poorer outcomes [5]. In the current case, the patient had symptoms for about three months, and although this duration may not appear long, any further delay could have enabled more extensive local invasion.

Imaging Modalities

Computed Tomography (CT) scanning of the paranasal sinuses remains invaluable for visualizing bony destruction and expansion characteristic of malignant disease. On the other hand, **MRI** is superior for delineating soft-tissue extension, orbital invasion, and perineural spread [6]. The combination of CT and MRI is thus frequently recommended in the comprehensive staging workup of suspected maxillary sinus malignancies. **PET-CT** has an established role in staging and restaging of head and neck cancers, allowing for the assessment of both local extent and distant metastatic potential [7]. In this patient's workup, MRI and PET-CT provided critical information regarding locoregional spread and the absence of distant metastases.

Histopathology and Differential Diagnosis

Squamous Cell Carcinoma (SCC) is the dominant histologic subtype in the maxillary sinus, accounting for up to 70–80% of cases, followed by other variants such as **adenocarcinoma**, **adenoid cystic carcinoma**, and **mucoepidermoid carcinoma** [8]. The presence of microcystic spaces, as seen in this patient's biopsy, can point toward a minor salivary gland carcinoma such as adenoid cystic carcinoma. However, some poorly differentiated SCCs may also exhibit cystic or microcystic features. Immunohistochemical panels (e.g., p63/p40 positivity for SCC, CD117/S-100 positivity for adenoid cystic carcinoma) are often vital to arrive at a precise diagnosis [9].

Distinguishing histologies is essential because they have different biological behaviors: for instance, adenoid cystic carcinoma is notorious for perineural invasion and late distant metastases, while undifferentiated SCC can exhibit rapid, locally aggressive growth [10]. Treatment plans, radiation protocols, and the need for specific targeted therapies can vary based on the exact histologic diagnosis.

Staging

Staging of maxillary sinus carcinoma is most commonly done according to the American Joint Committee on Cancer (AJCC) TNM classification. Key staging elements include:

- **T Category**: Tumor size, extent of invasion into surrounding structures (e.g., alveolar bone, palate, orbit, pterygoid plates, etc.).
- **N Category**: Degree of regional lymph node involvement. For maxillary sinus carcinoma, ipsilateral cervical lymph node metastasis occurs in a smaller percentage of cases initially but may become more common in advanced disease.
- **M Category**: Presence or absence of distant metastases.

In the present case, with no evidence of cervical nodal or distant metastases on PET-CT, the disease could be categorized as T3 or T4 (depending on the precise extent of bony involvement and invasion into adjacent structures), N0, M0 [11]. Precise T categorization would require detailed correlation between MRI, CT, endoscopic findings, and surgical exploration.

Treatment Approaches

1. Surgery:

Surgical resection remains the mainstay for resectable maxillary sinus carcinoma when feasible. The extent of the resection varies by tumor size and location, and includes:

- **Caldwell-Luc approach** or **Endoscopic Approach** in early lesions with limited sinus involvement.
- **Partial or Total Maxillectomy** for larger tumors involving the maxilla and possibly the alveolar ridge or palate. This can be accompanied by orbital exenteration if there is orbital invasion or involvement of the infraorbital rim. Complex reconstruction may follow to restore facial contour and function [12].

2. Radiotherapy:
Radiation therapy is commonly employed postoperatively if margins are close or positive, or if there is high-grade disease with a risk of locoregional recurrence. Technological advances—such as Intensity-Modulated Radiation Therapy (IMRT) and Proton Beam Therapy—help spare nearby critical structures (the orbit, brain, optic nerves) while ensuring an adequate dose to the tumor bed [1].

3. Chemotherapy:
While no single regimen is universally accepted, platinum-based chemotherapy (e.g., cisplatin) is often used in a neoadjuvant or adjuvant setting for advanced tumors or in combination with radiotherapy (chemoradiation) for unresectable lesions [2]. Patients with high-risk features, including large tumor size or advanced T stage, may benefit from concurrent chemoradiation.

4. Targeted and Emerging Therapies:

For certain histologies (e.g., EGFR-overexpressing tumors), targeted agents such as cetuximab may be considered. Immunotherapy is an emerging area of interest, particularly for recurrent or metastatic head and neck squamous cell carcinomas. However, large-scale data for maxillary sinus carcinomas specifically remain limited [3].

Prognosis and Follow-Up
Despite evolving treatment modalities, advanced maxillary sinus carcinoma continues to present a poor prognosis. Five-year survival rates can be as low as 30–50% in T3 or T4 lesions, largely due to the tumor's local aggressiveness and potential for recurrence [4]. Loco-regional control is critical, and careful follow-up is mandated to detect recurrences early.

Prognostic Factors include:

- **Stage at Diagnosis**: Advanced tumors (T3–T4) generally have worse outcomes.
- **Histological subtype**: Some variants, such as adenoid cystic carcinoma, carry a unique course with late recurrences.
- **Margin STATUS**: Clear surgical margins significantly improve local control rates.
- **Perineural Invasion**: Associated with higher recurrence and potential for cranial nerve involvement.

Special Considerations in the Elderly
Management in older patients such as our 81-year-old case is particularly challenging. Comorbidities must be weighed against the morbidity of extensive surgery. Comprehensive geriatric assessment can help determine tolerance to anesthesia, surgery, and adjuvant treatments [5]. Multidisciplinary input ensures that an individualized plan balances oncologic efficacy with quality of life.

Importance of Multidisciplinary Care
Optimal outcomes in sinonasal malignancies are most reliably achieved when multiple specialties collaborate. The head and neck surgeon, neurosurgeon (when necessary), radiation oncologist, and medical oncologist, along with pathology and radiology experts, all have key roles. Frequent tumor board discussions allow adjustments to be made to the treatment plan based on ongoing clinical and pathological information [6]. Additionally, supportive care teams—nutrition, speech and swallow therapy, and psychosocial support—are crucial for ensuring patient-centered care, especially given the anatomic and functional complexities of the midface.

Future Directions
Further research into molecular profiling may help in developing personalized treatments. With the emerging field of immunotherapy, the role of checkpoint inhibitors (e.g., pembrolizumab, nivolumab) and adoptive cell therapies needs exploration in rarer head and neck tumors such as maxillary sinus carcinoma [7]. For minor salivary gland pathologies like adenoid cystic carcinoma, new biologic therapies targeting pathways such as MYB-NFIB rearrangements are being investigated, but robust clinical trial data are lacking [8].
Ultimately, the integration of improved diagnostic imaging, refined surgical techniques, advanced radiation therapy technologies, and

the potential for tailored systemic therapies bodes well for future management, although current outcomes for advanced disease remain suboptimal [9-10]. Early detection, as well as preemptive investigation of atypical sinonasal complaints, remains one of the most significant factors in improving survival [11].

CONCLUSION

This case highlights the diagnostic challenge and possible severity of maxillary sinus carcinoma in an older patient. The disease often remains asymptomatic until it attains considerable local spread, stressing t he need for early suspicion in patients with persistent or worsening unilateral nasal symptoms. Advanced imaging by MRI and PET-CT played a crucial role in establishing the extent of the lesion and excluding distant metastases in this case. Histopathological examination showed a malignant neoplasm with microcystic appearance, and IHC studies will play an important role in determining definitive diagnosis and specialized treatment choice. A combination of surgery, radiation, and—where appropriate—chemotherapy usually represents the most fav orable chance of cure or long-term control in such tumors, although advanced age and comorbidities may dictate individualized pl anning. Multidisciplinary, cooperative care acro ss otolaryngology, radiation oncology, medical oncology, pathology, and radiology continues to be the hallmark of complete care for maxillary sinus cancers. With the development of new diagnostic markers and targeted therapies, there is hope for better survival and quality-of-life results; yet, early diagnosis remains one of the strongest predictors of prognosis. Finally, this case report adds to the increasing body of literature on maxillary sinus carcinoma, confirming the importance of incre ased clinical suspicion, thorough imaging, early biopsy, and multidisciplinary management to obtain op timal patient outcomes—especially in the elderly, where rapid but thorough management is crucial.

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