Perineural tumor spread in recurrent maxillary Squamous Cell Carcinoma: A Case Report

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Introduction

Perineural tumor spread (PNS) refers to the pathologic process in which malignant tumor cells spread along the perineural space, and it is recognized as one of the important invasive pathways in head and neck malignancies, with significant clinical, radiologic, and pathologic implications. In the oral and maxillofacial region, due to its complex anatomical structures and diverse neural distributions, PNS plays a critical role in tumor diagnosis, staging, treatment planning, and prognosis determination.

Case

A 74-year-old male patient presented to the Department of Oral and Maxillofacial Surgery at Chosun University Dental hospital. Approximately two months prior, he had undergone extraction of the left maxillary first and second molars at a local clinic due to persistent inflammatory lesions that failed to heal. Intraoral examination revealed irregular gingival overgrowth in the left maxillary posterior region. Incisional biopsy confirmed a diagnosis of moderately differentiated squamous cell carcinoma.

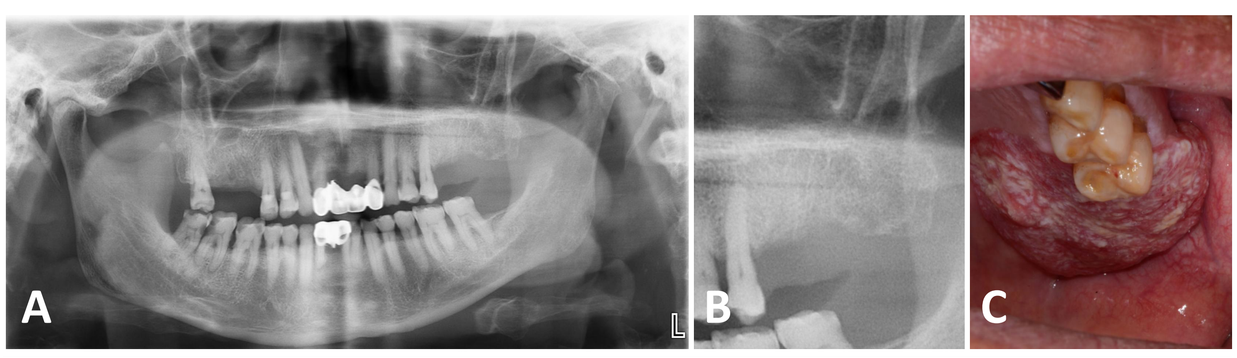

Figure 1. Initial panoramic radiograph and intraoral photograph of the patient. Histopathological examination confirmed a diagnosis of squamous cell carcinoma. (A, B) On the panoramic radiograph, bone resorption is observed in the left posterior alveolar ridge area, suggesting bone invasion by the tumor.

PET-CT demonstrated hypermetabolic lesion in the posterior left maxilla(maxSUV: 18.6), and indeterminate lymph nodes were seen in the left cervical region. Under general anesthesia, wide resection including partial maxillectomy involving the palate was performed, accompanied by selective neck dissection on the left side.

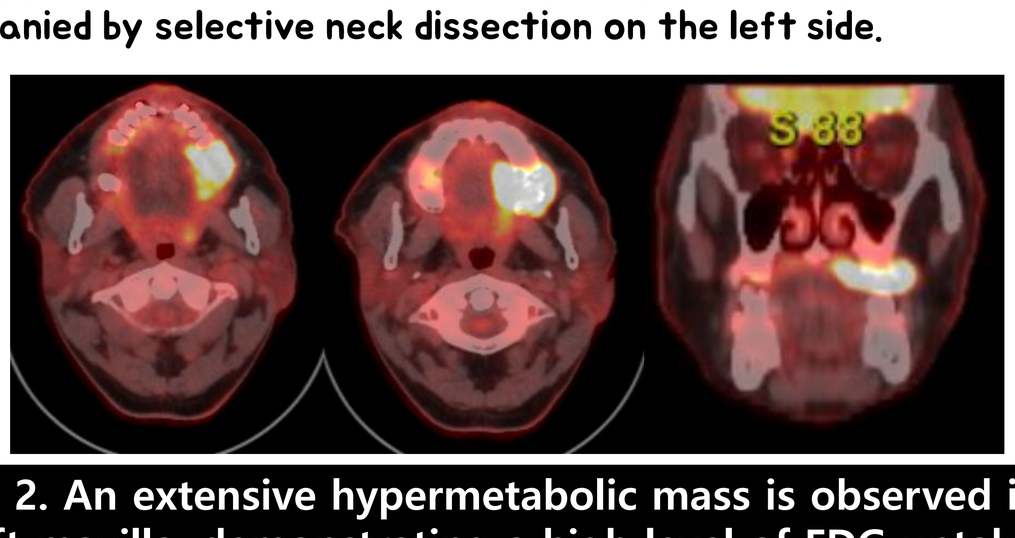

Figure 2. An extensive hypermetabolic mass is observed in the left maxilla, demonstrating a high level of FDG uptake (maxSUV: 18.6).

Approximately three years after surgery, the patient represented with pain and swelling at the operation site. Incisional biopsy revealed local recurrence of the tumor.

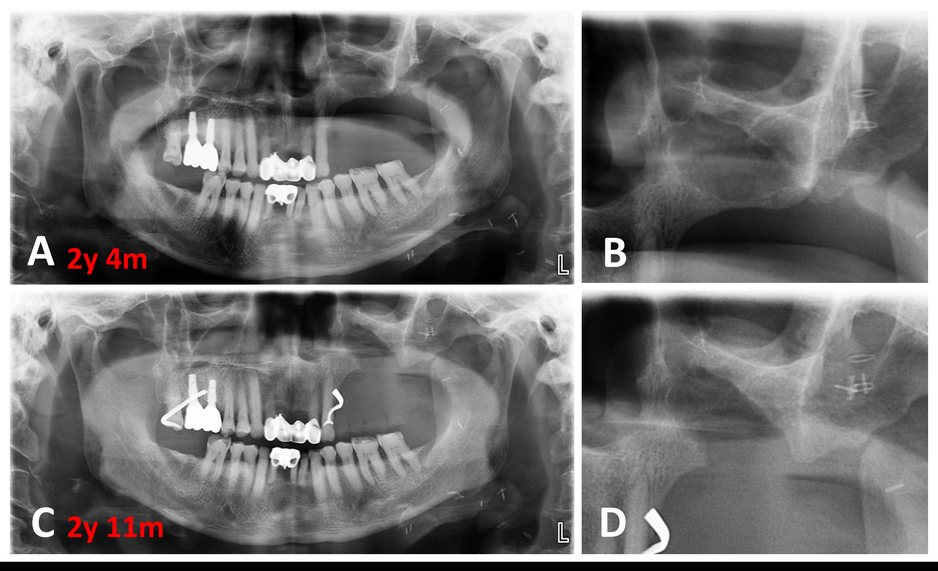

Figure 3. (A, B) 2 years and 4 months after surgery. No evidence of recurrence. (C,D) 2 years and 11 months after surgery. Destruction of the maxillary sinus floor, suggestive of tumor recurrence.

Contrast-enhanced CT imaging showed a massive, irregular mass destructing the entire left maxillary sinus wall, invading posteriorly into the pterygopalatine fossa and extending superiorly along the inferior orbital fissure, demonstrating features consistent with perineural tumor spread.

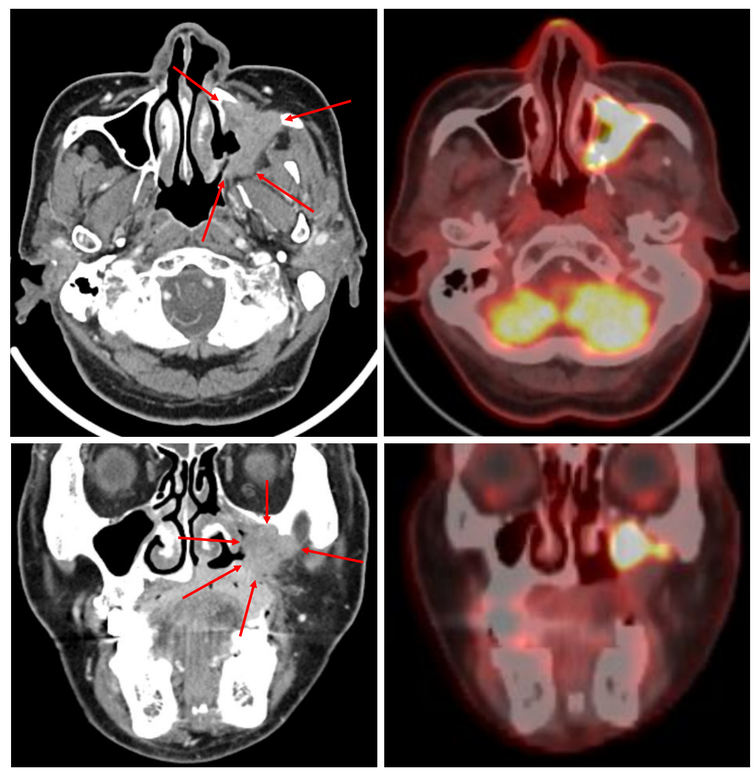

Figure 4. Contrast-enhanced CT and PET-CT demonstrate an irregular mass causing destruction of the left maxillary sinus.

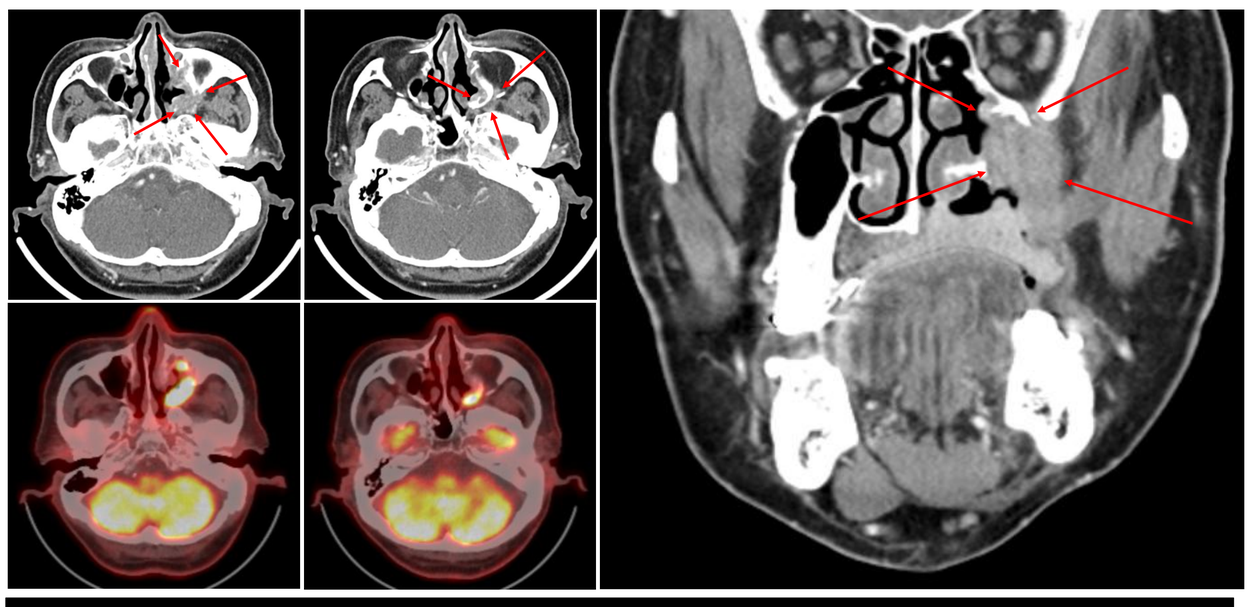

Figure 5. The mass extends superiorly and posteriorly, involving the orbital floor and pterygopalatine fossa, respectively. Notably, perineural tumor spread (PNS) is observed extending to the inferior orbital fissure.

To achieve complete tumor resection, orbital floor involved-subtotal maxillectomy was done, and the orbital floor was reconstructed using a titanium mesh plate. The patient is currently under postoperative follow-up.

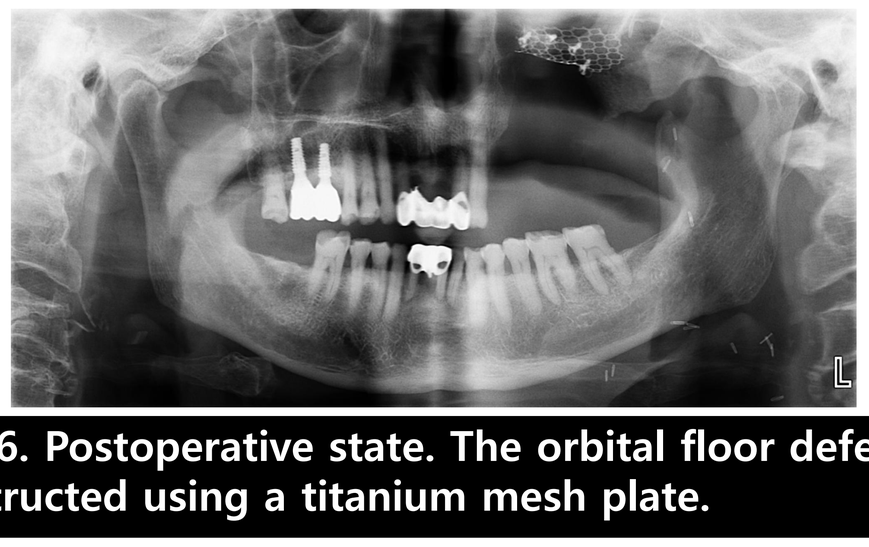

Figure 6. Postoperative state. The orbital floor defect was reconstructed using a titanium mesh plate.

Discussion

Perineural tumor spread (PNS) is a well-recognized pathway of locoregional extension in head and neck malignancies, particularly in squamous cell carcinoma (SCC). In this case, the patient experienced a recurrence of left maxillary SCC with tumor extension through the maxillary sinus, reaching the inferior orbital fissure a classic route of perineural invasion. Involvement of the pterygopalatine fossa is a critical finding, as it serves as a conduit for tumor spread along the maxillary division (V2) of the trigeminal nerve, facilitating further extension toward the middle cranial fossa and potential intracranial invasion. The destructive involvement of the posterior wall of the maxillary sinus and encroachment upon the orbital floor observed in this case highlight the aggressive nature of PNS. Notably, the tumor extended to the inferior orbital fissure, bringing it in close proximity to the orbital contents, which raises concerns for orbital invasion and possible complications affecting vision and cranial nerve function. This case underscores the importance of long-term follow-up and high-resolution imaging in patients with oral and maxillofacial SCC. Early detection of perineural spread is crucial for timely intervention, as it significantly impacts prognosis and therapeutic strategy.