CASE REPORT

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# Invasion palatum oral squamous cell carcinoma to the maxillary sinus investigation: case report

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## ABSTRACT

**Objectives:** This case report aims to analyze the specific characteristics of Oral Squamous Cell Carcinoma (OSCC) and its rare invasion of the palate.

**Case Report:** A 49-year-old male patient came to the Dental Radiology Installation of RSGM FKG UNPAD with a referral letter for a Cone Beam Computed Tomography (CBCT) examination. Based on the patient's anamnesis, he complained of swelling on the roof of the mouth that had lasted for 3 months, accompanied by pain, trismus, and persistent bad breath. Oral hygiene was poor; there was plaque, stains, and pale gums. The patient is an active smoker, smoking 1-2 packs per day; there is no history of similar diseases in the family. On extraoral examination, facial asymmetry was found due to swelling on the right cheek. On intraoral examination, gingival hyperplasia was found, accompanied by ulceration and reddish lesions on the roof of the mouth. The patient previously underwent a biopsy and excision of the roof of the mouth. Previous panoramic X-ray results showed lesions with unclear boundaries. On CBCT radiography, bone damage with irregular bone invasion and signs of malignancy indicate the characteristics of Squamous Cell Carcinoma (OSCC). 3D CBCT examination can be performed to accurately analyze and determine further diagnosis.

**Conclusion:** 3D CBCT radiography can be used as a supporting examination to analyze specific characteristics in OSCC cases. The results of CBCT analysis can be a guideline in planning pre-operative follow-up to be carried out.



***Keywords:*** *Squamous cell carcinoma, 3D CBCT, palate, ill-defined*
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## INTRODUCTION

A neoplasm is an abnormal mass formed from cells that grow continuously in an uncontrolled manner and affect the surrounding tissue, also known as a tumor. Most neoplasms are classified based on their tissue of origin. Malignant neoplasia originating from epithelial tissue is called carcinoma, while that originating from mesenchymal tissue is called sarcoma. One of the malignant neoplasias originating from epithelial tissue is Squamous Cell Carcinoma (SCC). Oral Squamous Cell Carcinoma (OSCC) is a non-odontogenic malignant tumor of the oral cavity that originates from epithelial soft tissue dysplasia. This condition is characterized by abnormal proliferation of dysplastic squamous cells on the epithelial surface that tend to infiltrate and metastasize to the surrounding tissue. OSCC is the second most common type of neoplasm, accounting for about 90% of all oral cancer cases. Its prevalence is recorded as twice as common in men compared to women, especially in the sixth to seventh decades of life.[1,2,3]

The etiology of OSCC is not yet known for certain. However, there are several risk factors that play a role in increasing its incidence. Internal (endogenous) risk factors include genetic aspects and malnutrition, while external (exogenous) risk factors include chronic sun exposure, Human Papillomavirus (HPV) infection, and bad habits such as smoking, betel chewing, consuming alcohol, and consuming excessive amounts of hot food or drinks.[4] Based on the distribution of its location in the oral cavity, the tongue is the most common location for OSCC, approximately 35% of cases, followed by the floor of the mouth (30%), mandibular gingiva (15%), buccal mucosa (10%), maxillary gingiva (5%), hard palate (3%), and retromolar (2%). OSCC often occurs in areas adjacent to the jaw and can invade bone tissue.[5,6]

Modalities that can be used to detect bone invasion include CT, MRI, single photon emission computed tomography (SPECT), multislice computed tomography (MSCT) with contrast, panoramic radiography (PR), and 3D Cone Beam

Computed Tomography (CBCT) imaging methods. In the assessment of bone invasion by oral tumors, CBCT showed a sensitivity of 90.9%, a specificity of 100%, and an accuracy of 95.7%, confirming that CBCT is a valuable tool for detecting bone invasion. In addition, CBCT has other advantages, namely being able to provide images with only one exposure in a relatively short time, resulting in a lower radiation dose for the patient, and being able to display lesion characteristics, location, lesion structure, tooth condition, and provide important additional information with higher resolution.[6,7,8] This case report aims to analyze the specific characteristics of Oral Squamous Cell Carcinoma (OSCC) and its rare pattern of palate invasion.

## CASE REPORT

A 49-year-old male patient came to the Dental Radiology Installation of RSGM FKG UNPAD with a referral for a CBCT examination. Anamnesis showed the main complaint was swelling of the roof of the mouth that had been going on for the past 3 months and was getting bigger, with pain felt for the past 1 month. Patients also experience limitations in opening their mouths, difficulty eating, and a persistent foul odor. The history revealed a current smoker, smoking 1-2 packs per day, with no family history of similar conditions. Further evaluation included a clinical examination and radiographs to confirm the diagnosis.

On extraoral examination, the patient's face was asymmetrical, with the right cheek appearing swollen. (Figure 1A). Intraoral examination showed gingival hyperplasia accompanied by swelling, ulceration, and reddish lesions in the hard palate area (Figure 1B). The patient's oral hygiene appeared very poor, with extensive plaque buildup, stains on the teeth, and pale-looking gingival tissue. ( Figure 1B). Intraoral examination showed gingival hyperplasia accompanied by swelling, ulceration, and reddish lesions in the hard palate area (Figure 1B). The patient's oral hygiene appeared very poor, with extensive plaque buildup, stains on the teeth, and pale-looking gingival tissue. (Figure 1B).

Panoramic radiograph examination showed loss of anterior teeth 11,21, as well as posterior teeth 18, 28, 38, and 48. The lesion in the upper jaw is localized and extends to the right maxillary sinus, with ill-defined and irregular radiointermediate area margins. The effect on the surrounding tissue causes destruction of the maxillary bone involving teeth 17, 16, 15, 14, 13, 12, 22, 23, and 24, 25, 26, and invades and destroys the sinus floor, filling the maxillary sinus space. (Figure 2). On CBCT examination, a lesion with an ill-defined and irregular radiointermediate area was seen on the upper jaw bone, which extended to involve the right and left nasal cavities, inferior nasal concha, and extended to the right maxillary sinus. This lesion invaded the maxillary bone, the bone in the palatal area, and the right zygomatic bone (coronal and 3D views) (Figure 3A, 3B). There is a loss of lamina dura, and the roots of the teeth appear tapered in teeth 17, 16, 15, 14, 13, 12, 22, 23, 24, 25, and 26. In teeth 13, 12, 22, and 23, floating teeth are seen due to a lack of bone support for the teeth. Invasion of the lesion is clearly seen, destroying the left maxillary sinus floor and maxillary bone (sagittal view) (Figure 4). Maxillary bone destruction is seen on the buccal side, which causes bone discontinuity in that area, and involves the right concha and nasal cavity (axial view). (Figure 4).

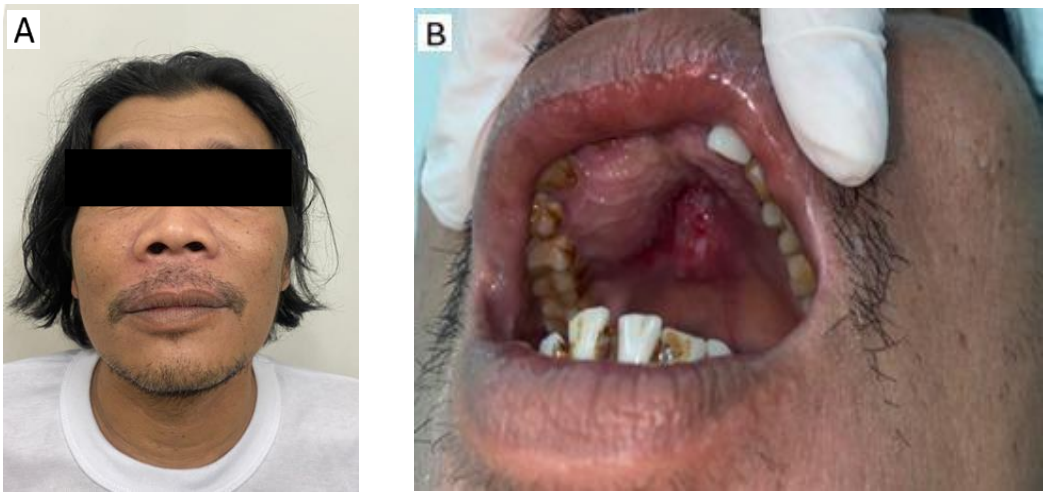


**Figure 1.** Clinical condition of the patient, **(A)** Extraoral view of the patient's profile shows facial asymmetry, **(B)** Intraoral condition of the patient shows hyperplasia and swelling of the hard palate

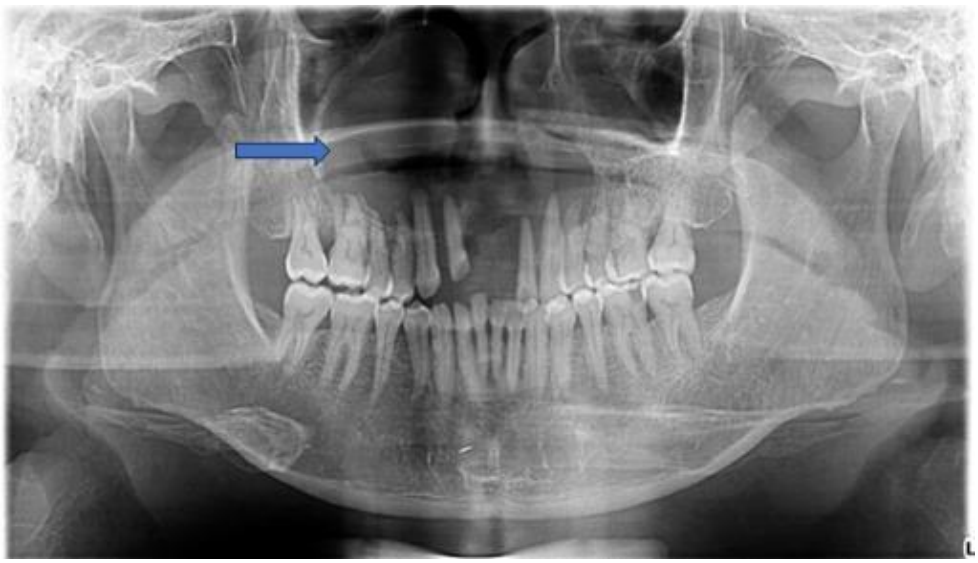

**Figure 2.** The patient's panoramic radiograph shows a lesion with an ill-defined and irregular radiointermediate area in the area of teeth 17–27, which extends into the right maxillary sinus (indicated by the blue arrow)

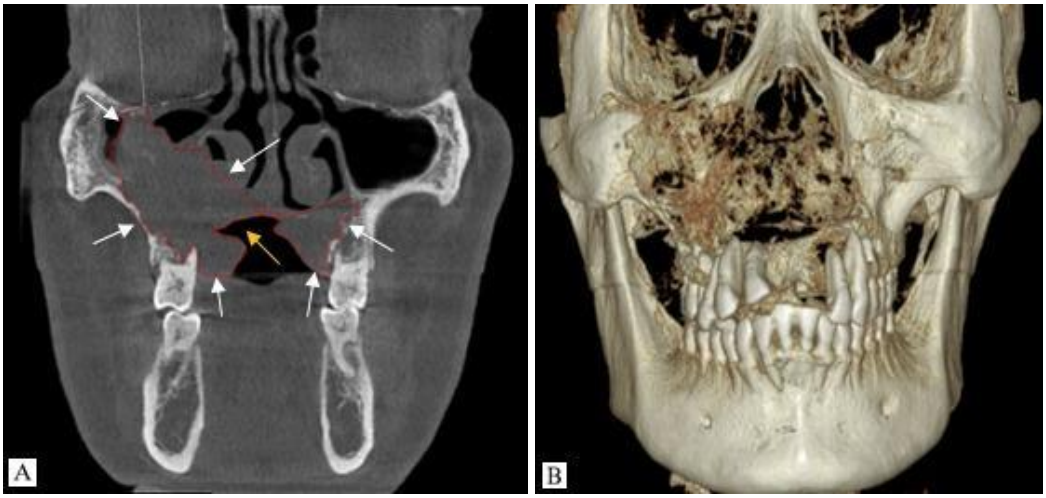


**Figure 3. (A)** CBCT coronal view shows an ill-defined and irregular radiointermediate lesion (white arrow); the lesion appears to invade and cause destruction of the palatal bone (yellow arrow) and the right zygomatic bone (blue arrow). **(B)** CBCT 3D view shows a lesion that invades and destroys the maxillary bone extending into the maxillary sinus.

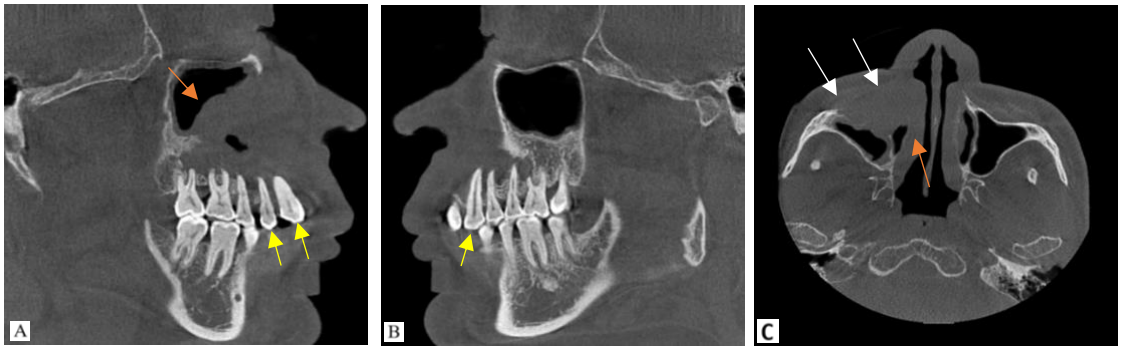


**Figure 4. (A)** CBCT sagittal view right shows a lesion that invades and destroys the maxillary bone and the maxillary sinus floor extending into the maxillary sinus (red arrow). Also visible are teeth with floating conditions (yellow arrows), loss of lamina dura, and roots that appear tapered on the involved teeth. **(B)** The CBCT sagittal view left shows floating conditions as well as loss of lamina dura and tapered roots on the involved teeth. **(C)** CBCT axial view shows invasion of the lesion to the right concha and nasal cavity (red arrow), and destruction of the buccal sinus floor (white arrow)

From the results of clinical and radiographic examinations and observing the rapidity of the lesions and the invasiveness that occurs, a diagnosis of Oral Squamous Cell Carcinoma (OSCC) can be made with a differential diagnosis of Susp Acute Inflammation.


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## DISCUSSION

The World Health Organization (WHO) reports that oral cancer ranks second as a cause of death from malignancy. Based on Globocan data in 2020, there were 5,780 cases of oral cancer in Indonesia, which ranks 17th for the highest number of new cases. The prevalence of oral cancer is estimated at around 3–4% of all cases of malignancy with various underlying etiologies.[9] The death rate from oral cancer ranges from 2–3% of all cancer deaths. One of the types of oral cancer that contributes most to the death rate is Oral Squamous Cell Carcinoma (OSCC). OSCC is a neoplasm that shows squamous differentiation, which originates from the oral mucosal epithelium, and causes significant morbidity and mortality, given the importance of oral tissue in the mastication process.[10]

Usually, in the early stages of OSCC, there are no specific symptoms. Some OSCC clinically appear as ulcers with fissures or prominent exophytic edges, can appear as lumps, as red lesions (erythroplakia), as white lesions, or a mixture of white and red. Other clinical features in the advanced stage include paresthesia, pain, foul odor, trismus, loose teeth, difficulty chewing and swallowing, sore throat, dysphagia, or accompanied by bleeding.[11,12]

Tobacco, alcohol, and viruses are the main risk factors for OSCC. Cigarette smoke can weaken local immunity in the oral cavity through heat, irritation, and the content of harmful substances such as nitrosamines, benzopyrenes, and aromatic amines. These substances damage epithelial cells, cause protein denaturation, and trigger the release of histamine and the enzyme xanthine oxidase, which produces free radicals in the form of reactive oxygen species (ROS) and reactive nitrogen species (RNS). These free radicals damage cell membranes, mitochondria, and DNA, thereby disrupting protein synthesis and DNA replication, ultimately triggering gene mutations and the development of malignancies. In this case, smoking is thought to be the main risk factor, exacerbated by the patient's poor oral hygiene, which also facilitated the development of the tumor. Alcohol consumption also increases the risk of malignancy because the combination of nicotine and ethanol increases the levels of the cytotoxin N-nitrosamine, which can damage cell membrane permeability. The relationship between viruses and oral cancer has also been proven, where the most important viruses are human papillomavirus (HPV), herpes viruses, adenoviruses, and hepatitis viruses. HPV and herpes are the viruses most often associated with oral cancer, where HPV, as an epitheliotropic DNA virus, can induce the growth of hyperplastic, papillomatous, and verrucous squamous cells in the stratified squamous epithelium in the mucous membrane. Squamous cell carcinoma (SCC) of the jaw typically exhibits aggressive local growth, starting from the squamous epithelium of the oral mucosa or gingiva, then infiltrating the submucosal tissue and bone cortex. In some cases in the jaw, the lesion can progress very rapidly within 2–4 months, causing significant swelling, pain, and bone resorption. In this case, the lesion initially arose from the squamous epithelium of the palatal mucosa. Over a period of approximately three months, the lesion rapidly expanded and invaded surrounding structures, including the mandible and maxillary sinus. This rapid progression suggests the tumor's aggressive nature. These clinical features support the suspicion of squamous cell carcinoma (SCC) with high invasive potential.[13,14,15,16]

Maxillary and mandibular bone invasion is a common complication of OSCC. Bone invasion can occur in two patterns. First, destruction of the periosteum and resorption of the outer surface of the cortical bone by osteoclasts, followed by filling of the resorption area by tumor cells. Second, tumor cells invade the bone marrow through enlargement of Volkmann and Haversian canals, periodontal spaces, or through direct resorption of cortical bone to replace the bone marrow.[17] The maxilla is more porous and less dense than the mandible, with the presence of the maxillary sinus, nasal cavity, and pterygoid fossae; tumors in this area are more likely to spread to the surrounding tissues. The risk of invasion is greater if the tumor is located within 1 cm of the bone surface, and larger soft tissue tumors have a higher tendency to invade bone. Approximately 55% of tumors with a diameter of less than 4 cm have bone invasion, while tumors with a diameter of more than 4 cm show invasion in about 45%. This shows that besides size, other factors also influence the bone invasion process.[18,19] In this case, the invasion began with an inflammatory process that occurred in the squamous epithelial tissue in the palate area and spread to the maxillary bone until it reached the maxillary sinus. Cases of Oral Squamous Cell Carcinoma (OSCC) with this invasion pattern are relatively rare.

Imaging studies are essential in the evaluation of OSCC. Panoramic radiography is often used as the initial step, providing a broad view of the teeth and jaws, but it lacks three-dimensional detail and makes it difficult to assess surrounding tissue involvement. For a more detailed evaluation,[20] Cone Beam Computed Tomography (CBCT) produces high-resolution, three-dimensional images, making it easier to see bony structures and anatomical relationships. This is important for assessing SCC invasion into surrounding areas, such as the maxillary sinus and nasal cavity. CBCT also has lower radiation than conventional CT, making it safer, although less accurate in assessing soft tissue.[21] CBCT radiography has been shown to improve the accuracy of detecting oral cancer invasion.[22] In general, OSCC shows radiographic images with ill-defined edges. Loss of lamina dura in the involved teeth and tapered tooth roots due to invasion of the lesion, as well as loss of supporting bone that causes the teeth to appear ‘floating’ (floating teeth).[23] In this case, there was a lesion

with an ill-defined radiointermediate area that invaded the right maxillary sinus, right and left nasal cavities, and caused destruction of the maxillary sinus floor and zygomatic bone. Bone destruction was also seen in the palate area (Figure 3). The lesion involved teeth 17, 16, 15, 14, 13, 12, 22, 23, 24, 25, 26, and 27. In these teeth, there were signs of malignancy in the form of loss of lamina dura and tapered tooth roots, and teeth 13, 12, 22, and 23 that appeared to be floating. Discontinuity of the maxillary bone was also seen in the buccal part due to destruction by the lesion and involvement of the right nasal cavity and right nasal concha. (Figure 4). OSCC lesions appear to grow progressively and are destructive to the alveolar bone.

In histopathological examination of OSCC, a collection of squamous epithelial cells is generally found arranged in nests, migrating from the epidermis to the dermis. Malignant cells appear large with eosinophilic cytoplasm and large, vesicular nuclei. Keratin pearls are also often found as a result of keratinization.[24]

Treatment of oral SCC generally requires the services of a multidisciplinary team; the main goals of treatment are always to eradicate the cancer, prevent recurrence, and, as far as possible, restore the form and function of the affected area. Several modalities are available for the treatment of SCC. These include excision or resection, radiotherapy, systemic cytotoxic chemotherapy, and epithelial growth factor receptor (EGF-R) blocking, or a combination of these, either simultaneously or in an ordered sequence. Surgery is the treatment for small and easily accessible oral SCC. However, advanced oral SCC is usually treated with a combined treatment program of surgery, chemotherapy, and radiotherapy. In cases of recurrent oral SCC, EGF-R inhibitors combined with chemoradiotherapy are the first-line treatment.

The poor prognosis of OSCC is due to late diagnosis because early symptoms are rarely seen. As a result, many patients already have regional metastases and tissue invasion at the time of diagnosis. The prognosis depends largely on the stage of the disease at diagnosis; the later it is detected, the worse the outcome.[17] Marco et al. 2024. If OSCC has not metastasized, the 5-year survival rate is about 85.1%. Despite advances in cancer treatment, the 5-year survival rate for advanced OSCC remains low.[18]

## CONCLUSION

Specifically, Oral Squamous Cell Carcinoma (OSCC) has typical radiographic characteristics in the form of a radiointermediate area with ill-defined boundaries and deep bone destruction or showing characteristics of irregular bone invasion accompanied by specific signs of malignancy, including the teeth involved appearing to be 'floating' (floating teeth) and loss of lamina dura, as well as tooth roots that appear tapered. The results of CBCT analysis can be an important guide in planning follow-up care, especially for the preoperative stage.

## ACKNOWLEDGMENTS

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## FOOTNOTES

All authors have no conflict of interest to declare in this article. Informed consent was obtained from the patient for inclusion in this case report.

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