

Primary Intraosseous Carcinoma of the Maxilla Derived from an Odontogenic Keratocyst: Clinicopathologic Insights (OKC), Odontogenic Cysts and Tumors, Maxilla

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Abstract

Primary intraosseous squamous cell carcinoma (PIOSCC) is an uncommon malignant neoplasm arising within the jawbone, without initial connection to the oral mucosa. It is believed to originate from the malignant transformation of odontogenic epithelial remnants, cysts, or tumors. Involvement of the maxilla is exceedingly rare compared to the mandible. The clinical presentation and radiographic features of PIOSCC are often variable and non-specific, which may complicate early diagnosis and lead to confusion with other odontogenic or inflammatory lesions. This case report describes a rare occurrence of PIOSCC developing from an odontogenic keratocyst (OKC) in the maxilla of a 35-year-old female patient. The report discusses the possible mechanisms underlying malignant transformation within odontogenic cysts, emphasizes the biological behavior of this neoplasm, and delineates the characteristic clinical, radiological, and histopathological findings associated with this rare entity.



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Primary Intraosseous Squamous Cell Carcinoma (PIOSCC); Odontogenic Keratocyst.

Introduction

Primary intraosseous squamous cell carcinoma (PIOSCC) developing from odontogenic cysts or tumors is an uncommon neoplasm of the head and neck, with maxillary involvement being exceptionally rare. The clinical and radiographic characteristics of these lesions often exhibit considerable variation, posing diagnostic challenges. It accounts for less

than 2% of all oral squamous cell carcinomas, with maxillary involvement being particularly uncommon compared to the mandible. Because of its low prevalence and varied clinical–radiographic presentation, PIOSCC often mimics benign odontogenic cysts or chronic inflammatory lesions, leading to frequent diagnostic delays or misinterpretation.¹

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Case-Report

A 35-year-old female patient reported to the outpatient department with a chief complaint of pain and swelling in the right upper anterior tooth region for the past two months and swelling in the same area for four days. Extraoral examination revealed a diffuse swelling involving the middle one-third of the face on the right side. Intraoral examination showed

an ill-defined swelling extending anteroposteriorly from the distal aspect of the right central incisor to the mesial aspect of the right second premolar, and superoinferiorly from the buccal vestibule up to the attached gingiva, resulting in vestibular obliteration. An unhealed extraction socket was also noted in the affected region. (Figure 1).



Fig. 1: Clinical picture

On palpation, the swelling was found to be tender, firm to hard in consistency, and neither compressible nor reducible. Radiographic investigations were performed and an ill defined radiolucency with ill defined borders was seen, extending from the midline to the mesial side of the 2nd premolar

mesiodistally and superoinferiorly extends 0.4 cms away from the floor of the maxillary sinus to the alveolar ridge (Figure 2) and patients previous radiograph is showing a well defined unilocular radiolucency with impacted canine.

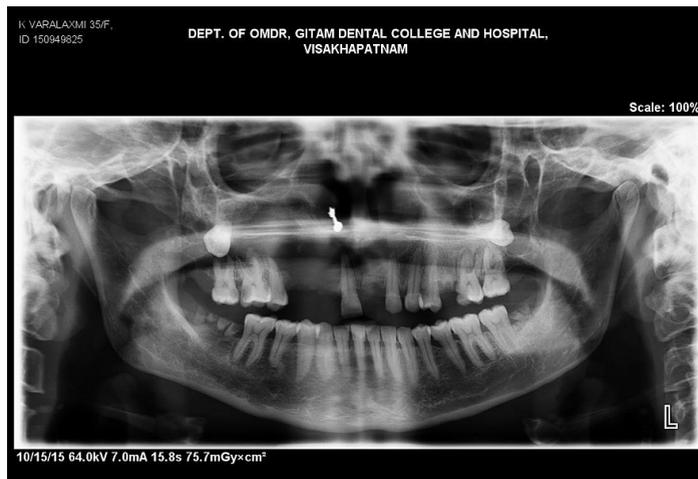


Fig. 1: OPG of the lesion

Materials and Methods for Clinical and Histopathological Evaluation

Following routine hematological investigations, an incisional biopsy was performed. The hematoxylin

and eosin (H&E)–stained soft tissue section revealed demonstrated parakeratinised corrugated cystic lining epithelium with basal columnar cells arranged in picket fence appearance (Figure 3).

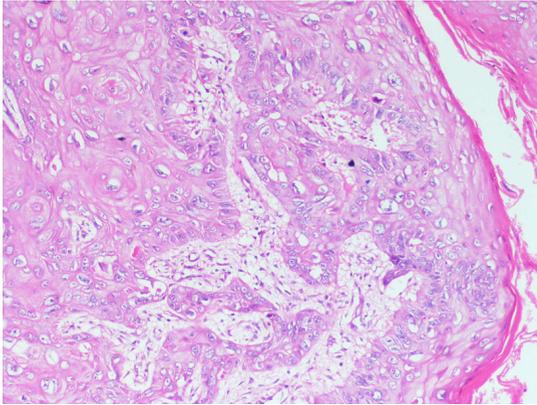


Fig. 3: PIO SCC arising from lining of OKC

The connective tissue is infiltrated with neoplastic epithelial cells arranged in the form of islands, cords & sheets. The epithelial islands showed dysplastic features like increased mitotic figures, increased nuclear cytoplasmic ratio, hyper chromatic nucleus, and many keratin pearls.

A final diagnosis of PIO SCC arising from OKC was made and the patient was operated by wide surgical resection of maxilla along with radiotherapy and chemotherapy and she is under follow up.

Discussion

The History of primary intra osseous squamous cell carcinoma (PIO SCC) begins in the year 1913 and described by the Shambhulingappa P, as features consistent with a central (intraosseous) epidermoid carcinoma of the jaw, later renamed as intraalveolar epidermoid carcinoma and PIO SCC by Willis in 1948, Pindborg 1971 respectively.¹

And subsequent contribution by the Elzay (1982), Slootweg and Muller (1984) & Waldron and Mustoe(1989) towards the classification of PIO SCC came to end with the replacement of the old terms by the WHO (2005) and is sub- classified as (i) a solid type, (ii) SCC arising from epithelial odontogenic tumours and (iii) SCC derived from odontogenic cysts. Whereas according to recent epithelial odontogenic cysts and tumours given by WHO (2005), OKC had been reclassified as the OKC.²

The diagnosis of primary intraosseous squamous cell carcinoma (PIO SCC) requires careful exclusion of other possible sources of squamous cell

carcinoma involving the jaw. The most widely accepted diagnostic criteria were first proposed by Waldron and Mustoe (1989), and later refined by Swei *et al.* (1994).

To qualify as a PIO SCC the following three criteria should be fulfilled.^{3,4}

1. There should not be any connections like ulcers with the overlying mucosa, skin or nasal or antral mucosa except causes like trauma and tooth extractions to demarcate it from SCC of surface mucosal origin.
2. The possibility of metastatic spread from a distant primary site should be excluded through thorough physical examination and advanced imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI).
3. There should be a direct transition from the normal epithelial lining to invasive carcinoma while diagnosing the squamous cell carcinoma has arisen from a OKC.

In the present case, all three criteria were fulfilled. Clinically and radiographically, the lesion was confined to the maxilla, with no mucosal ulceration or evidence of a primary tumor elsewhere in the body. Histopathological examination revealed islands and nests of malignant squamous epithelial cells arising within the cystic lining of an odontogenic keratocyst (OKC), confirming its odontogenic origin. These findings, in conjunction with the absence of distant metastasis, support the diagnosis of PIO SCC arising from an odontogenic keratocyst.

Histologically, the lesion characteristically demonstrates a keratinizing, well-differentiated squamous cell carcinoma associated with an odontogenic keratocyst (OKC). The principal differential diagnoses to be considered include keratoameloblastoma, squamous odontogenic tumor, and central high-grade mucoepidermoid carcinoma. They are excluded by absence of peripheral palisading cells with reverse polarization in the connective tissue tumor islands or sheets, cystic degeneration and foci of calcification, foci of mucous and intermediate cells respectively and metastatic lesions are excluded by negative PET scan reports.^{3,5}

Pathogenesis of PIOSCC EX OKC is still largely unknown. However, according to Gardner, long standing inflammation may be responsible factor for the malignant transformation.⁶ In which it includes the formation of reactive oxygen species and metabolites, causing the damage to the DNA genetic material, protein, and cell membranes and eventually it shows compensatory proliferative response of neoplastic cells against the normal programmed cell death (apoptosis) mechanism.²

According to Waldron and Mustoe review of 36 cases of malignant transformation in odontogenic cysts the 2-year survival rate of 53% if lymph node was positive.⁷ Wide maxillary resection has to be done along with the radiotherapy and chemotherapy. Regular follow up is required in these types of cases.

Conclusion

This report highlights the importance of careful histopathological examination the entire section of innocuous odontogenic cysts because of the possibility carcinomatous changes in their epithelial lining.

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This research did not involve human participants, animal subjects, or any material that requires ethical approval.

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Informed consent was obtained from the patient prior to writing of manuscript.

Author Contributions

- **Hyandavi Balla:** Conceptualization, Methodology
- **Divya Uppala:** Supervision.
- **Sreekanth Kotina:** Data Collection
- **Mahesh Nirujogi:** Writing – Original Draft.

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