

PRIMARY INTRAOSSEOUS SOLID CARCINOMA OF THE MANDIBLE: A CASE REPORT AND REVIEW OF LITERATURE

NADIRA MAMOON, RABIA ZAFAR, IRAM NIAZ, M. KHURRAM MAHMOOD
SAAD-UR-REHMAN SARWAR AND TAHIR AHMAD
Consultant Pathologist, Shifa International Hospital, Islamabad – Pakistan

ABSTRACT

A primary intraosseous carcinoma (PIOC) arising de-novo is an extremely rare tumour that is limited to the jaws. The majority of the reported cases of PIOC have their origin from the odontogenic cysts, those arising de-novo are rarely illustrated. The definite diagnosis of PIOC is often difficult as the lesion must be differentiated from other primary and metastatic squamous cell carcinomas of jaws. We report an uncommon case of PIOC arising de-novo in a 25 years old man. The clinical, radiological and histological features are described. This infrequent lesion should be considered in the differential diagnosis of any jaw radiolucency.

Keywords: Primary intraosseous carcinoma; Jaws; Primary squamous cell carcinoma, Metastatic squamous cell carcinoma.

INTRODUCTION

Primary intraosseous carcinoma (PIOC) is a very rare but well known entity affecting the jaw bones. It was first described by Loos in 1913 as central epidermoid carcinoma¹ and named as intra-alveolar epidermoid carcinoma by Wills in 1948.² Pindborg et al in 1972 were the first to suggest the term PIOC.³

According to the World Health Organization (WHO) classification, PIOC is an odontogenic carcinoma defined as "A squamous cell carcinoma arising within the jaw, having no initial connection with the oral mucosa and presumably developing from residues of the odontogenic epithelium."⁴

This odontogenic carcinoma was considered a single entity, until Elzay's review in 1982.⁵ Now PIOC arising de-novo is critically defined and is a clearly separate entity from carcinoma arising from an odontogenic cyst.^{4,6,7} Upto two – thirds of PIOC represents malignant transformation within odontogenic cysts while PIOC arising de-novo is relatively rare.⁸

Due to its rarity, we report a case of PIOC arising de-novo in the mandible with a review of the existing literature.

CASE REPORT

A 26 year old male reported to a local clinic with the complaints of constant pain and mild swelling on the left side of mandible for the last few months. Upon clinical examination a mild left facial swelling

was noticed (Fig. 1). The overlying skin was hyperaemic. There was no detectable lymphadenopathy. On intra-oral examination the left quadrant of mandible had 2 incisors, 1 canine, 1st premolar 2nd and 3rd molar. The 2nd premolar and 1st molar were missing. The alveolar ridge was covered by an intact alveolar mucosa of normal appearance. There was no evidence or history of a mucosal mass or ulceration in this region. There was a bony hard swelling at the angle of mandible which seemed to be intra-cortical. The patient didn't have a history of cigarette smoking, alcohol or betel quid use. His medi-



Fig. 1: Patient with mild left facial swelling (Front View).

cal history was not contributory.

Panoramic radiography revealed an ill defined osteolytic lesion extending anteroposteriorly through the left mandibular body and from the superior alveolar border to the lower body of the left mandible superoinferiorly and obliteration of the mandibular canal (Fig. 2). Bone scan revealed an active lesion of the left mandibular body. A differential diagnosis of chronic osteomyelitis or intrabony malignancy were considered. On doing the subsequent incisional biopsy, the intact mucosal surface of left alveolar ridge was noticed. The biopsy specimen which consisted of a) eroded buccal cortical plate and b) mandibular spongiosa was sent for histopathological examination to Armed Force Institute of Pathology.

Microscopic examination of the tissue fragmen

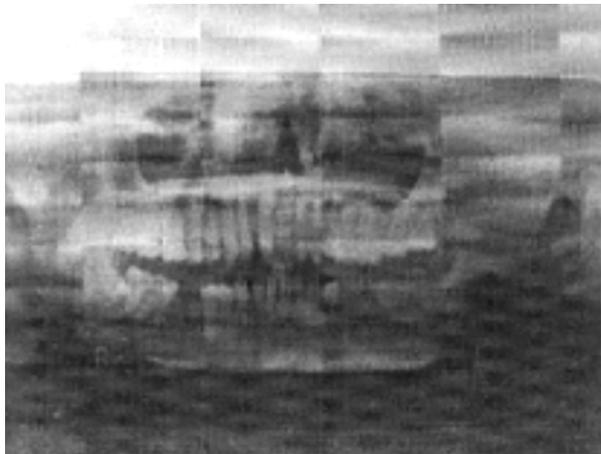


Fig. 2: Panoramic Radiography revealing a poorly defined osteolytic lesion of the left mandibular body.



Fig. 3: Photomicrograph showing mature bony trabeculae with small nests of atypical pleomorphic squamoid cells having hyperchromatic nuclei, intercellular bridges with focal areas of keratinization (haematoxylin and eosin $\times 40$).

ts of buccal cortical plate and mandibular spongiosa revealed mature bony trabeculae with nests of atypical squamoid cells. The tumour cells were pleomorphic and showed hyperchromatic nuclei and intercellular bridges with focal areas of keratinisation. Histological diagnosis of well differentiated squamous cell carcinoma – keratinising type was made (Fig. 3). The diagnosis was explained to the patient and further investigations including chest X-Ray and abdominal ultra sound was performed. A CT scan and bone scintigraphy to exclude distant metastasis were also conducted. With the exception of the destroyed area of the left mandible, all of the above mentioned investigations didn't reveal any abnormality.

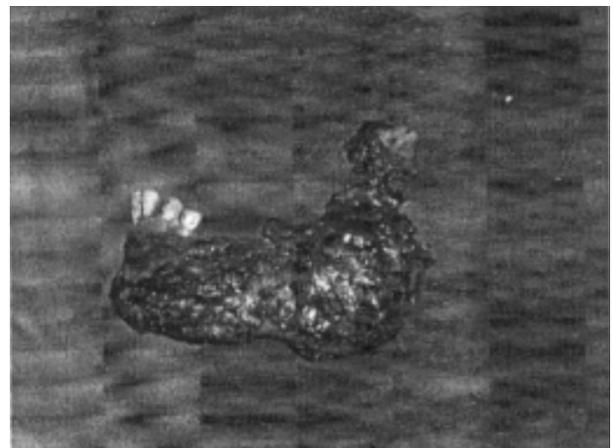


Fig. 4: Surgical specimen of left hemimandibulectomy (Lateral View).

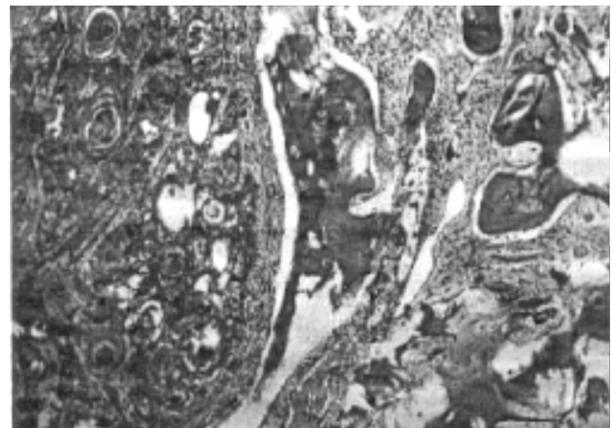


Fig. 5: Photomicrograph of mandibulectomy specimen with surrounding expanded cortex revealed nests and sheets of atypical squamoid cells invading the bony tissue (haematoxylin and eosin $\times 40$).

Left hemi-mandibulectomy was subsequently performed under general anaesthesia. The defect

was reconstructed by done plates and free fibular osteocutaneous flap. The surgical specimen, measuring approximately 10 × 6 × 4.5 cm in size, was dark brown in color, 2nd premolar and 1st molar was missing (Fig. 4). Alveolar mucosa attached along alveolar ridge measured 3 × 1 cm in diameter. No grossly visible tumour was seen. Cut surface revealed a whitish intra osseous lesion covered by intact cortical plates. Microscopy of the decalcified specimen revealed nests and sheets of atypical squamoid cells invading the bony tissue. The cells were pleomorphic with hyperchromatic nuclei and keratin pearl formation (Fig. 5). All the mucosal and soft tissue margins were free of tumor cells. Anterior and posterior muscle resection margins were also clear. The head of the mandible showed involvement by tumour cells, which were invading the surrounding soft tissue and involving the lateral resection margin at this site. Based on histopathological evidence, a definite diagnosis of primary intraosseous carcinoma (PIOC) arising de-novo (keratinizing type) involving the body. Ramus and head of left mandible was made. The post-operative course was uneventful. Presently the patient is undergoing radiotherapy and is under periodic follow-up.

DISCUSSION

Primary intraosseous carcinoma (PIOC) is a rare malignant neoplasm which occurs only in the jaw bones and predominantly in the posterior mandible. This tumour is believed to arise from the odontogenic epithelium and hence is also referred to as odontogenic carcinoma.⁸ The aetiology of the proliferation of the odontogenic epithelial rests is not known. The most probable factor may be a reactive inflammatory stimulus with or without a predisposing genetic cofactor.⁹

Table 1: Classification of primary intraosseous carcinoma (PIOC) according to Waldron and Mustoe.¹²

Type 1	PIOC ex Odontogenic Cyst
Type 2a	Malignant ameloblastoma
Type 2b	Ameloblastic carcinoma arising de-novo, ex ameloblastoma or ex odontogenic cyst
Type 3	PIOC arising de-novo: a) Keratinizing type b) Non-keratinizing type
Type 4	Intraosseous mucoepidemoid carcinoma

As per classification proposed by Waldron and Mustoe,¹⁰ given in Table 1, our case was of type – 3a PIOC, based on representative histological findings

of keratin pearl formation.

The most recent WHO classification of odontogenic tumours categorises primary intraosseous carcinoma (PIOC) as:¹¹

- a) Solid type carcinoma.
- b) Carcinomas arising from keratocystic odontogenic tumour (odontogenic keratocyst).
- c) Carcinoma arising from odontogenic cysts other than keratocystic odontogenic tumours.

For categorising a lesion as PIOC metastatic disease from other sites must be ruled out. Additional criteria for categorisation of a lesion as PIOC – solid type, include.^{5,10,12-14}

- a) Intact oral mucosa before diagnosis.
- b) Microscopical evidence of squamous cell carcinoma without a cystic component or other odontogenic tumour cells.

Absence of another primary tumour on chest radiographs obtained at the time of diagnosis and during a follow-up period of more than 6 months has been suggested by Suel et al.¹² Metastatic disease should be excluded by careful history taking and comprehensive systemic evaluation. In our patient, the possibility of metastasis was ruled out, since there was no history of malignant disease and detailed clinical and radiological examination did not reveal any pathology elsewhere in body. The mucosa of the oral cavity and the skin of the face were also normal. Thus both a primary tumour extending into the bone and metastatic disease was ruled out in our patient and the definite diagnosis of PIOC – solid type was made.

In the review of English language literature conducted by Y – J Lin et al, 40 cases of de-novo PIOC were identified between 1970 and 2004.¹⁵⁻²⁰ The male to female ratio was 3:2 and it was more frequent in the sixth and seventh decades of life.¹⁵⁻¹⁹ The site of involvement was mostly the posterior section of the mandible rather than the maxilla.¹⁵⁻¹⁹

The most common symptoms in these malignant tumors is pain and swelling, and sometimes sensory disturbances like paresthesia and numbness.⁸ In our patient constant pain and mild swelling on the left side of the mandible were the presenting complaints.

To et al, reported a delay in correct diagnosis ranging from a few weeks to as long as 18 months.¹³ Naturally, this delay contributes to a poor prognosis in these patients. Radiographic examination is one of the most effective methods of detecting PIOC's.¹⁴ A lesion that is enclosed by bone can be regarded as of intraosseous origin. CT scan can also facilitate correct diagnosis. PIOC's show great variation in size and shape and in the appearance of their border. Nolan²¹ reported well defined smoothly contoured borders for slowly growing PIOC's and poorly defi-

ned, ragged borders for rapidly growing tumours. Because of this variation in radiological presentation of PIOC's margins, it is difficult to differentiate them from other benign or malignant tumors.¹² Our cases also had an ill defined, irregular border.

The different types of histological features reported for POIC's is not pathognomonic. Different histological features which are indicative of odontogenic origin like peripheral palisading, plexiform or alveolar growth, central stellate reticulum like areas and stromal hyalinization around the epithelial islands are helpful in reaching a diagnosis, though they are not specific.^{14,5,12,16} In our patient the histopathological features were of well differentiated squamous cell carcinoma with no evidence of lining epithelium of odontogenic cysts or other odontogenic tumor cell and clinically and histologically there was no evidence that the lesion had any connection with the oral mucosa.

In the review by To et al,¹³ 48% of the PIOC patients showed a survival period ranging from 6 months to 5 years. There are a few studies regarding the survival time in different types of PIOC. Everasole et al,²² reported 53% 2 year survival rate for the PIOC arising in odontogenic cysts, whereas Elzay⁵ demonstrated a 40% 2 year survival rate for the de-novo lesion. This indicates that the patient with PIOC originating from odontogenic cysts may have a better prognosis than the patients with de-novo lesions.²⁰

The management for de-novo PIOC includes Radical Surgery with or without post-operative radiotherapy.⁸ Other treatment modalities, such as radiotherapy or chemotherapy, should be reserved for patients with lesions that cannot be surgically controlled.⁸ For our patient, treatment consisted of left hemimandibulectomy followed by radiotherapy because the surgical margin was involved on the lateral site.

In *conclusion*, we emphasise the importance of clinical and histopathological examination of any apparently innocuous radiolucent lesion in the jaws because although PIOC is a rare entity but any delay in its diagnosis can have a profound effect on the prognosis of the patient.

REFERENCES

- Loos D. Central epidermoid carcinoma of the jaw. *Dtsch Monatschr Zahnheik* 1913; 31: 308.
- Willis RA. Pathology of tumors. St. Louis: The C.V. Mosby Company; 1984.
- Prindborg JJ, Kramer IRH, Toroni H. Histologic typing of odontogenic tumors, jaw cysts and allied lesions. Geneva: World Health Organization, 1971: Pp. 35-6.
- Kramer IRH, Pindborg JJ, Shear M. Histologic typing of odontogenic tumors (2nd edn). Berlin: World Health Organization, Springer – Verlag. 1992: Pp. 112-6.
- Elazy RP. Primary intraosseous carcinoma of the jaws. Review and update of odontogenic carcinomas. *Oral Surg Oral Med Oral Pathol* 1982; 54: 299-303.
- Muller S, Waldron Ca. Primary Intraosseous squamous carcinoma. Report of two cases. *Int J Oral Maxillofac Surg* 1991; 20: 362-6.
- Bridgeman A, Wiesenfeld D, Buchanan M, Slavin J, Costello B. A primary intraosseous carcinoma of the anterior maxilla. Report of a new case. *Int J Oral Maxillofac Surg* 1996; 25: 279-81.
- Thomas G, Pandey M, Mathew A, Abraham EK, Francis A, Somanathan T, et al. Primary intraosseous carcinoma of the jaw: pooled analysis of world literature and report of two new cases. *Int J Oral Maxillofac Surg* 2001; 30: 349-55.
- Anneroth G, Hansen LS. Variations in keratinizing odontogenic cysts and tumors. *Oral Surg Oral Med Oral Pathol* 1982; 54: 530-46.
- Waldron CA, Mustoe TA. Primary intraosseous carcinoma of the mandible with probable origin in an odontogenic cyst. *Oral Surg Oral Med Oral Pathol* 1989; 67: 716-24.
- Barnes L, Eveson JW, Richard P, et al, Editors. World Health Organization Classification of tumors: Pathology and Genetics of Head and Neck Tumors. Lyon: JARC Press: 2005: P. 290.
- Suei Y, Tanimoto K, Taguchi A, Wada T. Primary intraosseous carcinoma; review of the literature and diagnostic criteria. *J Oral Maxillofac Surg* 1994; 52: 580-3.
- To EHW, Brown JS, Avery BS, Ward – Booth RP. Primary intraosseous carcinoma of the jaws: three new cases and a review of the literature. *Br J Oral Maxillofac Surg* 1991; 29: 19-25.
- Kaffe I, Ardekian L, Peled M, Machtley E, Lauffer D. Radiological features of primary intra-osseous carcinoma of the jaws. Analysis of the literature and report of a new case. *Dentomaxillofac Radiol* 1998; 27: 209-14.
- Zwetyenga N, Pinsolle J, Rivel J, Majoufre – Lefebvre C, Faucher A, Pinsolle V. Primary intraosseous carcinoma of the jaws. *Arch Otolaryngol Head Neck Surg* 2001; 127: 749-7.
- Ide F, Shimoyama T, Horie N, Kaneko T. Primary intraosseous carcinoma of the mandible with probable origin from reduced enamel epithelium. *J Oral Pathol Med* 1999; 28: 420-2.
- Thomas G, Sreelatha KT, Balan A, Ambika K. Primary intraosseous carcinoma of the mandible: a case report and review of the literature. *Eur J Surg Oncol* 2000; 26: 82-6.
- Cavalcante ASR, Carvalho YRC, Cabral LAG. Tender mandibular swelling of short duration. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002; 93: 167-70.
- Punnya A, Kumar GS, Rekha K, Vandana R. Primary intraosseous odontogenic carcinoma with osteoid / dentinoid formation. *J Oral Pathol Med* 2004; 33: 121-4.
- Y – J Lin, C – H Chen, W – C Wang, Y – K Chen, L – M Lin. Primary intraosseous carcinoma of the man-

- dible: A case report. *Dentomaxillofacial Radiology* 2005; 34: 112-6.
21. Nolan R, Wood NK. Central Squamous cell carcinoma of the mandible. Report of Case. *J oral Surg* 1976; 34: 250-4.
 22. Eversole LR, Sabes WR, Rovin S. Aggressive growth and neoplastic potential of odontogenic cysts: with special reference to central epidermoid and mucoepidermoid carcinomas. *Cancer* 1975; 35: 270-82.
 23. Sloomweg PJ, Muller H. Malignant ameloblastoma or ameloblastic carcinoma. *Oral Surg Oral Med Oral Pathol* 1984; 57: 168-76.
 24. Morrison R, Deeley TJ. Intra-alveolar carcinoma of the jaw. Treatment by supervoltage radiotherapy. *Br J Radiol* 1962; 35: 321-6.
 25. Shear M. Primary intra-alveolar epidermoid carcinoma of the jaw. *J Pathol* 1959; 97: 545-55.
 26. Falaki F, Delavarian Z, Salehinejad J, Shaghafi S. Squamous Cell Carcinoma arising from odontogenic keratocyst. A case report. *Med Oral Patol Oral Cir Bucal* 2009; 14: E171-4.
 27. Lindqvist C, Teppo L. Primary intraosseous carcinoma of the mandible. *Int J Oral Maxillofac Surg* 1986; 15: 209-14.
 28. Van der Waal RI, Buter J, van der Waal I. Oral metastases: report of 24 cases. *Br J Oral Maxillofac Surg* 2003; 41: 3-6.
 29. Spouge JD. Odontogenic tumors: a Unitarian concept. *Oral Surg Oral Med Oral Pathol* 1967; 24: 392-403.
 30. Eul Hwan Hwang, Yong – Suk Choi, Sang – Rae Lee. Primary intraosseous carcinoma of the mandible. Report of case. *Korean J Oral Maxillofac Radial* 2005; 35: 235-9.
 31. DI, Raut, SA Khedkar. Primary intraosseous mucoepidermoid carcinoma of the maxilla: a case report and review of literature. *Dentomaxillofacial – Radiology* 2009; 38: 153-8.
 32. Chia – Chun Lu, Kuo – Min Chang, Chung – Ji Liu. Primary intraosseous carcinoma of the mandible: a case report. *Chin J Oral Maxillofac Surg* 2004; 15: 38-47.