

MALIGNANT LESIONS OF MANDIBLE ON ORTHOPANTOMOGRAM- OUR EXPERIENCE

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ABSTRACT**BACKGROUND**

Orthopantomography plays a great role to categorise the lesion according to its location and relationship with respect to tooth. It is simple and cost effective. Orthopantomography can provide clue regarding the aggressiveness of the lesion and therefore a radiologist can provide an idea as to which lesion can be left alone and which lesion require therapy or surgery.

MATERIALS AND METHODS

Patients with specific complaint pertaining to lower jaw, pain in the lower jaw, discharge from mouth, etc. were studied by orthopantomogram examination. The machine use for the study is D. B. Troniks and the duration of the study is one year from January 2016 to December 2016.

RESULTS

A study of 50 patients were carried out at our institute having symptoms and sign pertaining to lower jaw. Maximum cases were found in fourth decade. Males were more affected than females. On radiographic features, most lesions were mixed followed by sclerotic and then lytic. Most common benign malignant lesion found in our studies was squamous cell carcinoma followed by multiple myeloma.

CONCLUSION

The orthopantomography examination is very useful and important diagnostic aid in diagnosis of these mandibular lesions, as it is a simple and nontraumatic procedure. Various mandibular lesions showing radiographic features like solid-cystic appearance, location, margins, internal architecture, bony expansion, cortical breach, effect of lesion on adjacent structures, etc. play an important role in diagnosis of these lesions.

KEYWORDS

Benign Lesions, Mandible, Orthopantomogram.

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BACKGROUND

The mandible is a very important bone of the face, which develops a wide spectrum of benign and malignant pathologies. Malignant lesions are less common in mandible. The presence or absence of signs and symptoms does not always help in differentiating benign from malignant process.¹ Orthopantomogram (OPG) also known as "panoramic radiography" or "rotational radiography" is the initial radiographic examinations in suspected mandibular lesions. It produces a single image of facial structures, including both maxillary and mandibular arches and their supporting structure. As compared to other imaging

modalities, orthopantomogram is used as the primary imaging modality for mandibular lesions, because of its easy availability, low radiation dose, low cost, imaging of the broad anatomic region at relative convenient ease and speed of the procedure. The radiographic imaging plays important role in initial diagnosis and to detect location, extent or spread of the lesion.

AIMS AND OBJECTIVES

- Role of orthopantomogram in diagnosis of malignant mandibular lesions.
- Study of the morphological characteristics of malignant mandibular lesions with the help of orthopantomogram.

MATERIALS AND METHODS

Patients with specific problems like swelling of lower jaw, pain in the lower jaw, discharge from mouth, etc. were studied from orthopantomographical examination. Although, some cases were found from orthopantomographical study for other complaint rather than pertaining to lower jaw.

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The machine use for the study is D. B. Troniks and the duration of the study is one year from January 2016 to December 2016.

Inclusion Criteria

- All the patients with jaw swelling either painful or painless.
- Patients of all age group and sex.
- Patients with known jaw swelling of malignant aetiology.

Exclusion Criteria

- Pregnant females and neonates.
- All jaw swelling belonging to benign aetiology.

RESULTS

Out of total 50 patients, results are as below.

Age	Number of Cases
1-10	1
11-20	2
21-30	3
31-40	13
41-50	14
51-60	10
>60	7
Total	50

Table 1. Age Wise Distribution

Sex	Number of Cases
Male	35
Female	15
Total	50

Table 2. Sex Wise Distribution

Margin	Number of Cases
Ill-defined	36
Indeterminant	14
Total	50

Table 3. Margin Wise Distribution

Density	Number of Cases
Lytic	9
Sclerotic	10
Normal	6
Mixed	25
Total	50

Table 4. Distribution as per Density

Non-Odontogenic Tumours		
Epithelial origin	Squamous cell CA	9
	Mucoepidermoid CA	3
	Osteosarcoma	3
	Chondrosarcoma	5
	Ewing's sarcoma	4

Haematopoetic malignant lesions	Multiple myeloma	7
	Lymphoma	2
	Leukaemia	2
Metastasis		4
Total		39
Odontogenic Tumours		
Odontogenic carcinoma		6
Malignant ameloblastoma		5
Total		11

Table 5. Total Number of Cases per Pathologies

Age Group (Years)	Malignant Tumours
0-10	Ewing's sarcoma Leukaemic infiltration Metastatic neuroblastoma
11-20	Osteosarcoma Ewing's sarcoma
20-40	Chondrosarcoma
40 and above	Ameloblastoma, metastatic tumours, multiple myeloma, osteosarcoma

Table 6. Age Distribution of Common Malignant Tumours of the Mandible



Figure 1. Malignant Ameloblastoma

OPG showing multiloculated radiolucent lesion with internal soft tissue haziness involving ramus and adjacent posterior body of left hemimandible causing cortical expansion, cortical breach and intraoral soft tissue extension. This patient present with distant metastasis in lung.



Figure 2. Ameloblastic Carcinoma

Post segmental right mandibulectomy status in patient with known case of ameloblastoma present with destructive expansile radiolucent lesion with internal bony septations,

cortical breach with associated root resorption of left last molar tooth. On histology, the lesion shows malignant cells, however, no evidence of distant metastasis noted.

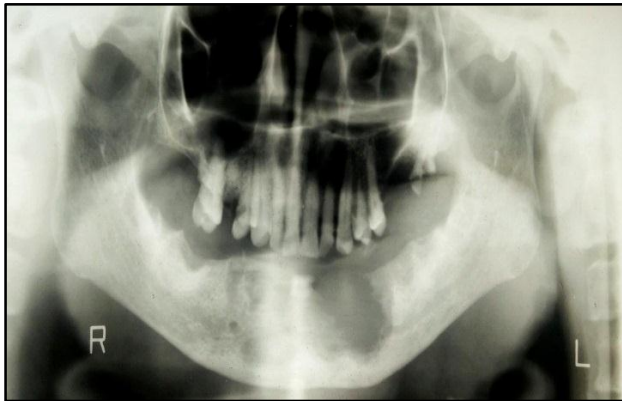


Figure 3. Squamous Cell Carcinoma Arising from Gingivolabial Sulcus

Infiltrating adjacent body of left-sided body of hemimandible appears as osteolytic lesion in body of left hemimandible with irregular margin and associated soft tissue component.

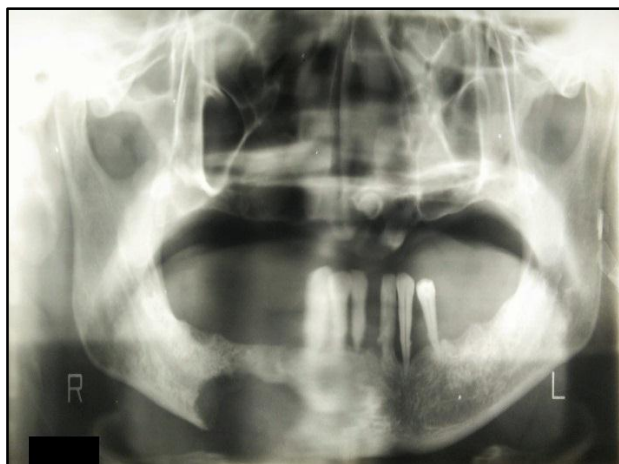


Figure 4. Right Submandibular Gland Malignancy

Causing localised erosion of inferior aspect of body of right hemimandible.

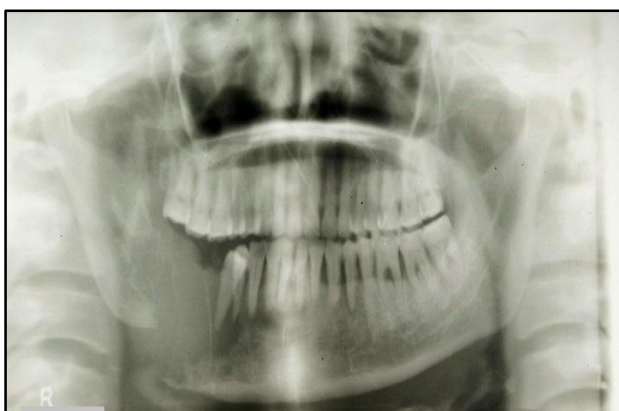


Figure 5. Squamous Cell Carcinoma of Right RMT

Causing erosion of angle ramus and adjacent posterior body of right hemimandible with significant associated soft tissue component, significant cortical destruction, involvement of mandibular canal and overlying floating tooth.



Figure 6. Mucoepidermoid Carcinoma

Osteolytic lesion with irregular margins, associated soft tissue component and pathological fracture involving body of mandible with displacement of overlying teeth.



Figure 7. Osteosarcoma

Ill-defined lytic sclerotic lesion with associated significant sunray type periosteal reaction and soft tissue haziness in left hemimandible.



Figure 8. Myxoid Chondrosarcoma

On OPG, there is ill-defined lytic lesion with soft tissue haziness with ill-defined sclerotic margins at angle of left hemimandible.

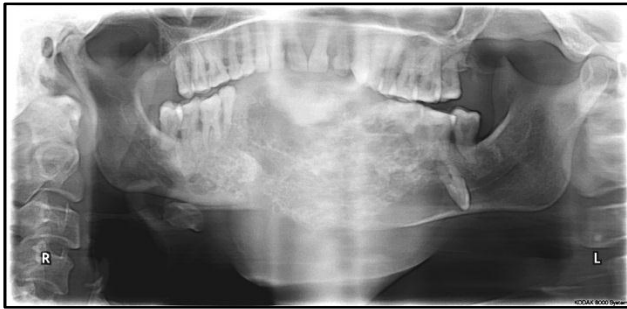


Figure 9. Ewing's Sarcoma

Expansile lesion with internal lytic and sclerotic areas with associated large soft tissue component central body of mandible.



Figure 10. Multiple Myeloma

Multiple radiolucent punched out round/oval-shaped radiolucent osteolytic lesions in b/l ramus of mandible.

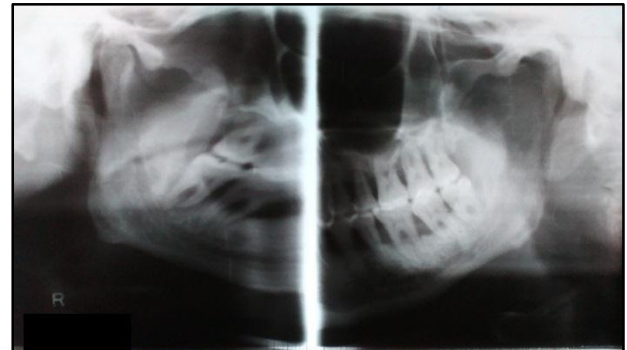


Figure 11. Plasmacytoma

Expansile radiolucent lesion with ill-defined margins and internal faint septations involving ramus, condylar and coronoid process of left hemimandible.

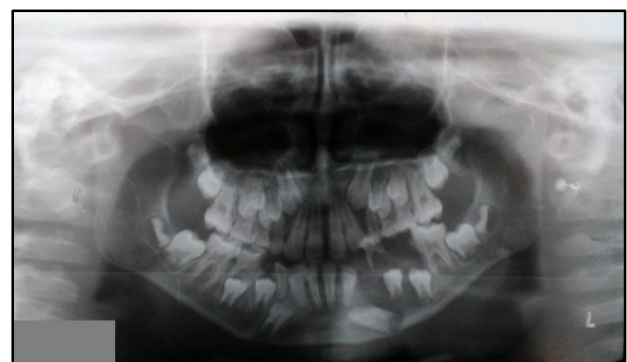


Figure 12. Lymphoma

Panoramic radiograph showing supernumerary teeth with ill-defined radiolucent lesion with fine internal septation involving body of left hemimandible with displacement of overlying teeth.



Figure 13. Leukaemic Infiltration

Radiolucent lesion with irregular margins involving mandibular canal in body of left hemimandible with displacement of overlying teeth.



Figure 14. Metastasis

Ill-defined soft tissue opacity in the region of right hemimandible with cortical destruction of ramus and body of right hemimandible.

DISCUSSION

A wide spectrum of malignant lesions occur in mandible showing variable degree of destructive potential. Malignant lesions of the mandible can be classified as odontogenic origin and nonodontogenic origin.

Malignant odontogenic lesions include odontogenic carcinoma and malignant ameloblastoma/ameloblastic carcinoma. Nonodontogenic malignant tumours of the mandible are grouped into four categories- (1) Carcinoma (epithelial origin), (2) Sarcoma (mesenchymal origin), (3) Haematopoietic origin and (4) Metastasis.

The most of the malignant lesions of the mandible are secondary to invasion of the surrounding mucosa. The most common malignant tumours of the mandible represent SCCs of the oral cavity, notably carcinoma of the buccal mucosa and the floor of the mouth that invade the mandible secondarily. Metastasis is uncommon in mandible, however, it may present with the first manifestation of a malignant lesion outside the head, more commonly from the breast and lung. The osteogenic sarcoma is the most common

sarcomatous lesion in the mandible and is suggested when a bone-forming matrix with sclerosis is found within the tumour on CT images.

Malignant lesions of the mandible present with varying degree of signs and symptoms, including ulceration, swelling, pain, displaced or mobile teeth, poorly healing or non-healing of surgical or trauma site, weight loss and haemorrhage. Paraesthesia, due to mandibular canal involvement is more commonly seen in malignant lesion than in benign lesions. Onset of symptoms of malignancies is often rapid. Swelling maybe intraoral or outside resulting in facial asymmetry. However, many of the mandibular lesions are very difficult to examine clinically. Radiographic imaging plays an important role to demonstrate the extent of these lesions. Radiographic imaging is essential not only for the diagnosis of malignant mandibular lesions, but also to guide therapy and to monitor treatment response.²

General radiographic features of mandibular malignancies are ill-defined borders with lack of cortication, absence of encapsulation and irregularly-shaped swelling. Majority of malignant lesions show radiolucent internal architecture, because most of them, neither produce bone nor stimulate the formation of reactive bone. A majority of mandibular malignancies show cortical bone destruction with/without periosteal reaction, Codman's triangle.

This review provides a comprehensive approach to the radiographic interpretation of benign mandibular lesions.

Malignant Odontogenic Tumours

Odontogenic Carcinoma

Odontogenic carcinomas are very rare. Odontogenic carcinomas are highly aggressive intraosseous lesions, histopathologically showing poorly-differentiated epithelial and clear cells. The prognosis of this tumour is very poor due to high rate of recurrence.³

On panoramic radiograph, the lesion appears as a diffuse, "honeycomb" like radiolucent lesion with surrounding cortical destruction.

Malignant Ameloblastoma/Ameloblastic Carcinoma-

The majority of ameloblastoma is benign with less than 1% showing malignant behaviour.⁴ The majority (80%) of ameloblastomas occur in posterior body and ramus of mandible.⁵ Ameloblastomas mainly occur in the 3rd to 7th decade of life. Classic ameloblastomas do not have distant metastases, but variants with metastatic behaviour despite histologically benign features are called as "malignant ameloblastoma" and tumours with histologically malignant features, but without the metastatic potential are called as "ameloblastic carcinomas".⁶

On panoramic radiographs, the tumour appears as a marked buccolingual cortical expansion with internal osseous septae giving rise to a "soap bubble" appearance (Figure 1). Associated tooth displacement or root resorption may also be seen. It is very difficult to distinguish these tumours from benign ameloblastomas at imaging alone and histopathologic analysis is required for definitive diagnosis.⁷ However, aggressive features such as extraosseous

extension, significant cortical destruction and extensive solid components may suggest malignant potential.^{8,9} It shows a very high rate of recurrence with highly aggressive recurrent lesion (Figure 2).

Malignant Non-Odontogenic Tumours- Carcinoma-Lesions of Epithelial Origin Squamous Cell Carcinoma-

Squamous cell carcinoma is a malignant tissue arising from surface epithelium. It is related to tobacco chewing. It presents with the invasion of adjacent soft/connective tissue, underlying bone, local and regional nodes and metastasis to lung, liver, skeletal, etc. It usually occurs in patients >50 years of age, more common in males. It presents as ulcerated indurated painful/painless lesion arising from the oral mucosa.

On OPG, the osseous involvement of the mandible by squamous cell carcinoma is manifested by saucer-shaped erosive defect over alveolar ridge (Figure 3) (Figure 4). As the disease advances, it manifests as irregular cavity of variable sizes, multiple lytic foci coalescing to form a large irregular lesion and moth-eaten appearance (Figure 5). In advanced lesions, the "floating teeth" sign maybe seen. Expansion of the cortex is rare. Periosteal reaction and bony sclerosis are rarely seen.

Mucoepidermoid Carcinoma

Mucoepidermoid carcinoma is an epithelial tumour arising in bone. It possibly originates from pluripotent odontogenic epithelium or from the lining of the cyst. It is more commonly seen in females. It mimics benign tumours or cyst in appearance. It more commonly present with painless swelling with facial asymmetry. It usually occurs in molar and premolar region, superior to mandibular canal.

On panoramic radiograph, it presents with uni or multiloculated mass with a soap bubble appearance with thick corticated borders. It expands the buccal and lingual cortices with scalloping of cortices (Figure 6).

Sarcoma-Mesenchymal Origin

Osteosarcoma

Osteosarcoma is an osteoid producing highly malignant tumour of mesenchymal origin. Primary mandibular osteosarcoma is uncommon. More often, it involves posterior part of the mandible. There are three major types of osteosarcoma noted- osteoblastic, chondroblastic and fibroblastic. These types cannot be differentiated on imaging. Patients with mandibular osteosarcoma most commonly present with swelling with facial asymmetry and bleeding.

On OPG, the mandibular osteosarcoma present with lytic destructive lesion with loss of trabeculations with ill-defined margins more often associated with areas of sclerosis. There is associated periosteal reaction also noted, more commonly sunburst type with sunray spicules (Figure 7).

Chondrosarcoma

Chondrosarcoma is a malignant bone tumour of cartilaginous origin. It is mainly seen in 4th decades. Histopathologically, there are four varieties of chondrosarcoma noted- clear cell type, dedifferentiated type, myxoid type and mesenchymal type.

On radiograph, chondrosarcoma present as mixed density round, ovoid lesion with indistinct border, maybe associated with periosteal reaction, mainly sunray or hair on end periosteal reaction. It may expand the mandibular cortices (Figure 8).

Ewing's Sarcoma

Ewing's sarcoma usually occurs between the ages of 5 and 25 years with male/female ratio 2:1.

On OPG, the lesion appears as ill-defined radiolucent uni/multilocular lesion with areas of sclerosis found around the margins of the lesion. The lesion, early in the development, appears with an appearance of mottled rarefaction (Figure 9). It produces laminated or onion skin effect along the bone surface. Advanced cases may present a sunray pattern.

HAEMATOPOETIC MALIGNANT LESIONS

Multiple Myeloma

Multiple myeloma is a malignant neoplasm of the plasma cells. It usually involves multiple bones particularly ribs, sternum, skull, vertebral column and clavicle. Mandible are not uncommonly affected. It usually found in 4th and 7th decade.

A localised form of this disorder is known as "Solitary Plasmacytoma of Bone (SPB)." It is potentially capable of progressing into generalised myelomatosis.

On panoramic radiograph, multiple myeloma appear as multiple punched-out, oval or rounded radiolucent lesions without any surrounding bone reaction⁹ (Figure 10). Small radiolucent areas are confined to medulla. There is no evidence of associated osteoblastic activity noted. Usually, there is no cortical expansion noted. Skeletal survey must be done to confirm the diagnosis.

Three main radiographical presentations of SPB of jaw are noted- Multilocular soap bubble appearance, unilocular radiolucency with a cystic appearance and ill-defined destructive bone resorption¹⁰ (Figure 11).

Lymphoma

Lymphomas are malignant tumours developed from cells of the lymphatic system. While Hodgkin's Lymphomas (HL) most often involve lymph nodes in the head and neck, Non-Hodgkin's Lymphomas (NHL) can equally affect extranodal sites.¹¹ It occurs in all age group, however, adults affected more commonly than children with no gender predilection. Patient with mandibular lymphoma present with pain, jaw swelling, tooth mobility and cervical lymphadenopathy.

On panoramic radiograph, the lesion present with osteolytic lesion with loss of lamina dura (Figure 12). As the disease progresses, small radiolucent foci scattered throughout the affected areas and involving trabecular bone

and lamina dura will become apparent. As the lesion grows, it causes marked expansion of the bone, sometimes new periosteal bone formation at its periphery producing sunray appearance. In addition, erosion or perforation of cortex may occur. As compared to other malignant lesions of the mandible in lymphoma, there is minor or no cortical destruction noted. The differential diagnosis of mandibular NHL includes other infiltrative processes such as myeloma, leukaemia and bone metastases.²

Leukaemia

Acute leukaemia is the most common malignancy in childhood resulting from proliferation of leukaemic cells within red bone marrow. Patient present with pallor, petechiae, purpura and ecchymosis in the skin and mucosal surfaces and bone pain.

More common radiographic findings of leukaemic infiltration of bone include generalised reduced bone density, metaphyseal lucent band, lytic bone lesions, metaphyseal cortical bone erosions and periosteal reaction^{12,13} (Figure 13).

Metastasis

Metastatic tumours are foci of malignant diseases that originated in a distant primary tumour. Usual pathway is through bloodstream. Metastasis located in the mandible generally arise from primary tumours located below the clavicles. Metastasis most commonly seen in 5th to 7th decades of life. Patient may present with pain, numbness, paraesthesia, numbness, bleeding or pathological fracture. In adults, the common sites of origin includes breast, kidney, lung, colon, rectum, ovary, etc. In young children, the primary cause is mainly neuroblastoma.

On OPG, the metastasis appear as radiolucent lesion with ill-defined borders associated soft tissue component causing cortical breach Figure 14. More often periosteal reaction may be noted. Teeth may float in the soft tissue mass or maybe displaced. In some cases, multiple lesions noted in mandible, which later coalesces with each other. Although, majority of metastasis appear as a radiolucent lesion, some cases show osteoblastic metastasis as in prostate carcinoma.

Although, the imaging aspect is not specific in the presence of a patient with a history of cancer, the diagnosis of mandibular metastasis should be considered in the differential diagnosis first, particularly when the lesion shows no relationship to dental structures.² Approximately 30% of mandibular metastasis present with occult primary lesion.³

CONCLUSION

There are wide variety of malignant lesions noted arising from mandible, which are either odontogenic or non-odontogenic origin with a variety of radiographic appearances. Orthopantomography plays vital role in identification of such lesions, which mainly appears as radiolucent as well as radiopaque with panoramic radiograph. The orthopantomography examination is very useful and important diagnostic aid in diagnosis of these malignant mandibular lesions as it is a simple and non-

traumatic procedure. However, the various mandibular lesions show overlapping radiographic imaging characteristics, the clinical features like patient age, disease prevalence, signs, symptoms and radiographic features like solid cystic appearance, location, margins, internal architecture, bony expansion, cortical breach, effect of lesion on adjacent structures, etc. play important role in diagnosis of these lesion. OPG can provide clue regarding the aggressiveness of the lesion and therefore a radiologist can provide an idea as to which lesions can be left alone and which lesions require some therapy.

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