

Imaging of cystic lesions of the jaws - Pictorial essay

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Abstract

Imaging of the cystic lesions of the jaws has progressed from plain radiography, orthopantomography to cone beam computed tomography. These advanced methods contribute to the diagnosis of the cystic lesions of the jaws correlating well with histological features. Clinically, swelling and pain are the major features. Cystic lesions are more common in the mandible and odontogenic cysts are frequently encountered as compared with non-odontogenic cysts. Imaging features are described to differentiate one cyst from the other. Cyst like or pseudo cystic lesions are also described and illustrated.

Keywords: Imaging odontogenic; non-odontogenic; pseudocystic lesions of jaws; orthopantomography; cone beam computed tomography

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Introduction

A cyst is defined as a fluid containing sac, lined by epithelium and surrounded by connective tissue. It may have a capsule and may also have semisolid contents. The dental parts of mandible and maxilla are generally dealt by department of dental sciences. However, the bony part is also most important and should be studied imageologically, since some of the lesions of the jaws are not related to teeth only [1-5]. Radiological differentiation of these lesions is important in order to manage these. In practice, mandibular lesions are more common than maxillary. Radiologically, the term 'cystic' should not be confined only to completely lytic or lucent lesions. Solid radio lucent lesions may also appear imageologically lytic/lucent and are called cystic.

These cystic lesions may be classified in the following manner (Table 1). The more common cystic lesions of the mandible include periapical (radicular) and follicular (dentigerous) cysts [6-8]. Next in common

include odontogenic keratocyst (OKC), Stafne (static bony cavity) cyst [9] and solitary bone cysts which include post traumatic cysts, simple or hemorrhagic. The rare cyst like or pseudo cystic lesions include ameloblastoma, fibrous dysplasia, ossifying fibroma, brown tumor etc [10, 11] (Table 2). Classification of the cysts of the jaw as defined by WHO in 1992 (Table 1).

Table 1: True cystic lesions (Modified list of WHO).

<ul style="list-style-type: none"> • Radicular cyst (Periapical cyst) • Odontogenic Keratocyst • Dentigerous (follicular) cyst • Residual cyst • Odontogenic cyst • Incisive Canal Cyst • Solitary bone cyst • Aneurysmal bone cyst • Stafne cyst • Medullary pseudo cyst

In the differential diagnosis, the following cyst like lesions should be considered (Table 2).

Table 2: Cyst like lesions.

<ul style="list-style-type: none"> • Ameloblastoma • Fibrous dysplasia • Ossifying fibroma • Giant cell tumor • Giant cell reparative granuloma • Brown tumor • Hemangioma • Peri apical abscess • Traumatic bone cyst • Langerhans histiocytosis

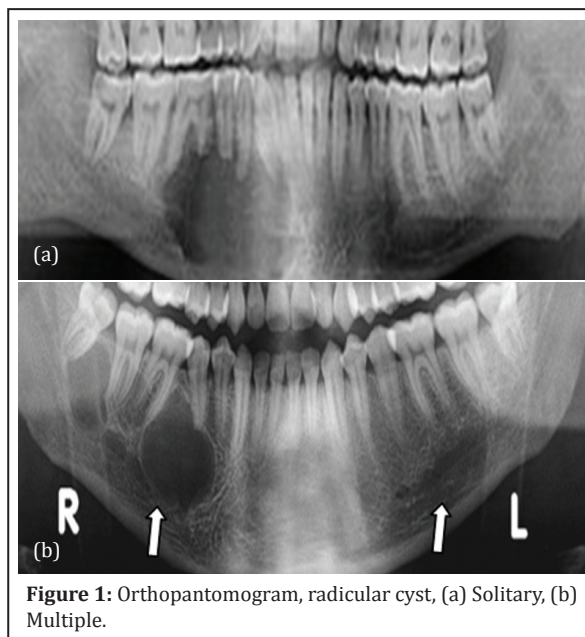
Imaging methods

- Conventional radiology
- Intraoral and occlusive
- Orthopantomogram (OPG)
- Conventional CT
- Cone beam CT (CBCT)
- Magnetic resonance imaging (rarely used)

Imaging characteristics

Radicular cyst (Periapical cyst)

This is the most common cyst and is seen with relationship to the apex of the tooth. Radiologically, a poorly defined para-apical area of lucency is noted. Its sclerotic margin is continuous with lamina dura of the periphery of the cyst. The size of the cyst varies between 0.5 to 1.5cms in diameter (Figure 1a,b). They may be multiple.

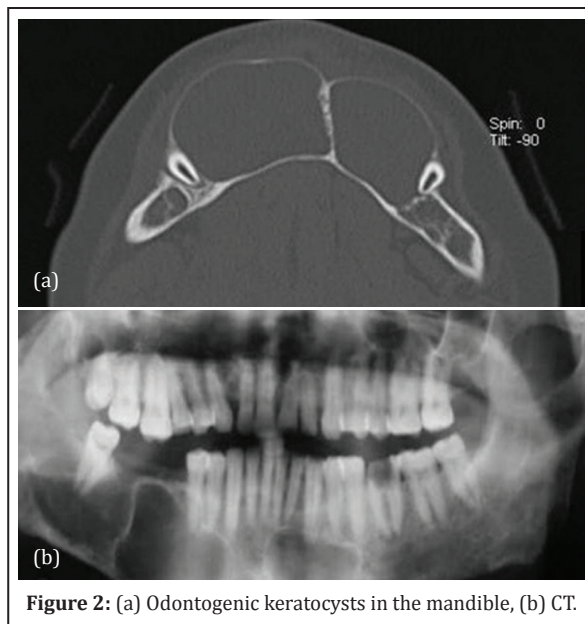


Odontogenic keratocyst

This is a keratonised cyst and generally follows cystic degeneration of the enamel organ prior to the formation of tooth. Hence, it replaces the tooth. It is most commonly located in the body and ramus of the mandible and when multiple may also occur in the anterior mandible or anywhere in the maxilla.

Imaging features

Imaging wise, thinning of the cortex surrounding the lucency is noted commonly located in the posterior part of the mandible (Figure 2 a,b). These may be



multiple which are generally associated with 'Gorlin-Goltz syndrome' consisting of multiple nevoid - basal cell carcinoma and keratocysts (Figure 2c).

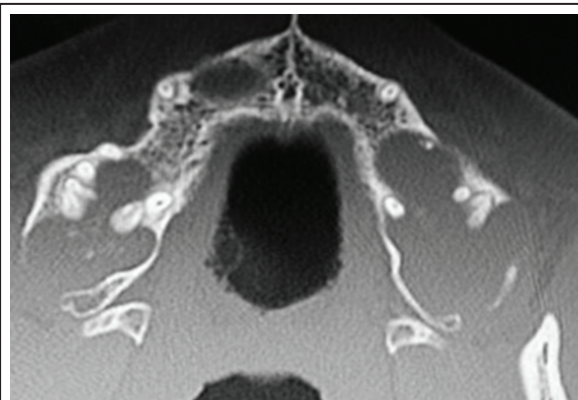


Figure 2c: Multiple keratocysts in maxilla in a patient with Gorlin-Goltz syndrome.

Dentigerous cyst or follicular cyst is a slow growing, benign and non-inflammatory odontogenic cyst, thought to be of developmental origin. It is associated with the crown of an unerupted (or partially erupted) tooth. The cyst cavity is lined by epithelial cells derived from the reduced enamel epithelium of the tooth forming organ. It is the 2nd most common odontogenic cyst after radicular cyst. Dentigerous cysts are the most common developmental cysts of the jaw, frequently associated with impacted third molar tooth. Bilateral dentigerous cysts are rare and occur typically in association with a developmental syndrome. It is encountered more in males than in females and is most common in an unerupted mandibular 3rd molar. It may also involve maxillary canine, mandibular premolar, maxillary 3rd molar and supernumerary teeth.

Imaging features

It is usually unilocular and well-defined lucent lesion with sclerotic margins. It is associated with crown of unerupted or impacted tooth. Larger cysts cause cortical expansion leading to facial asymmetry, tooth displacement and root resorption (Figure 3a-d). Persistence of bony trabeculae is seen in larger cysts giving multiloculated appearance.

Odontogenic myxoma

It is a rare mandibular tumor, which is benign but locally aggressive. It rarely appears in bones other than the jaws. It is considered to be derived from the mesenchymal portion of the tooth germ. Radiologically,

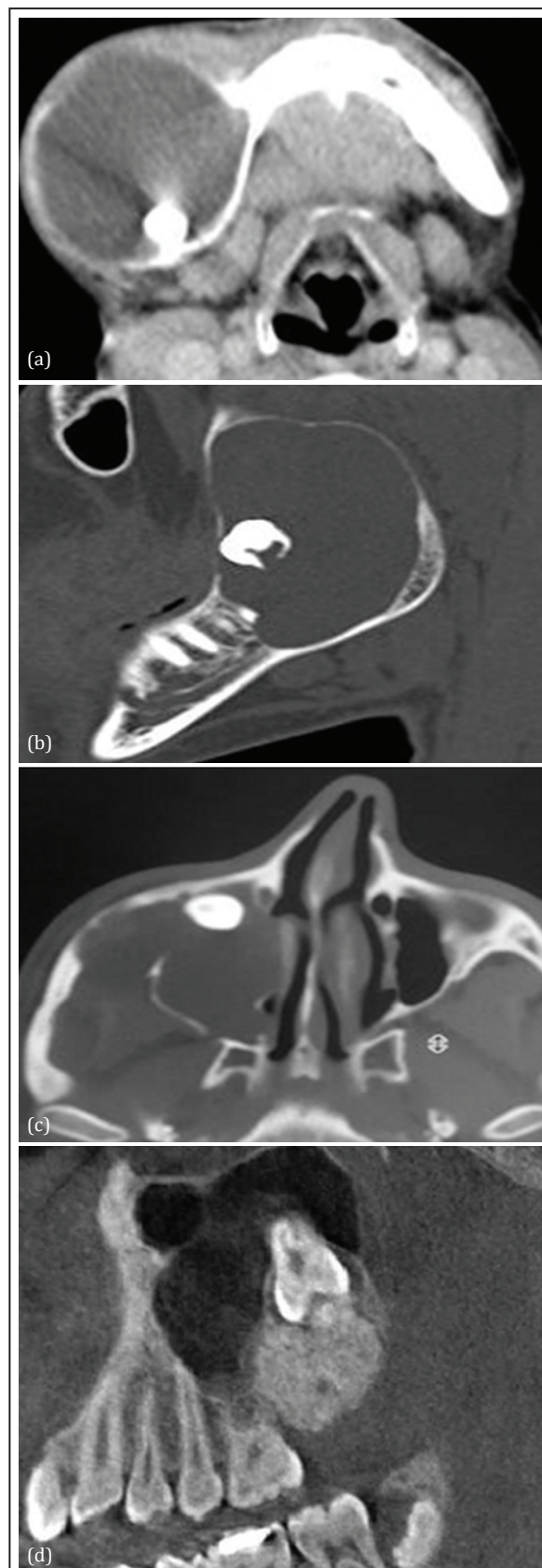


Figure 3: Dentigerous cyst CT, (a, b) Mandibular, (c, d) Maxillary.

a multi loculated cystic lesion displacing the teeth (Figure 4). The diagnosis is made only by histological features.

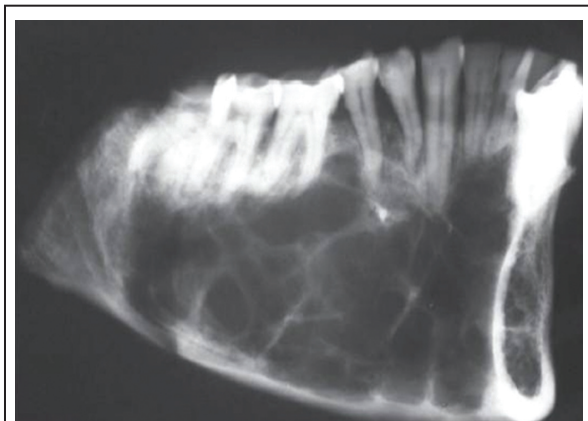


Figure 4: Odontogenic myxoma.

Residual cyst occurs due to incomplete surgical removal of a radicular or other inflammatory cyst. The histological and clinical features of the residual cyst are very similar to that of the radicular cyst except for the site of the extracted teeth. The radiographic feature is a well-defined unilocular radiolucent structure of varying size at the edentulous area of a previous extracted tooth site (Figure 5).



Figure 5: Residual cysts - Post tooth extraction.

Odontogenic cyst

This is also called lateral periodontal cyst (Botryoid cyst). The origin of this cyst is believed to be related to proliferation of rests of dental lamina. Radiologically, this lucent cystic lesion is placed in between two teeth (Figure 6).

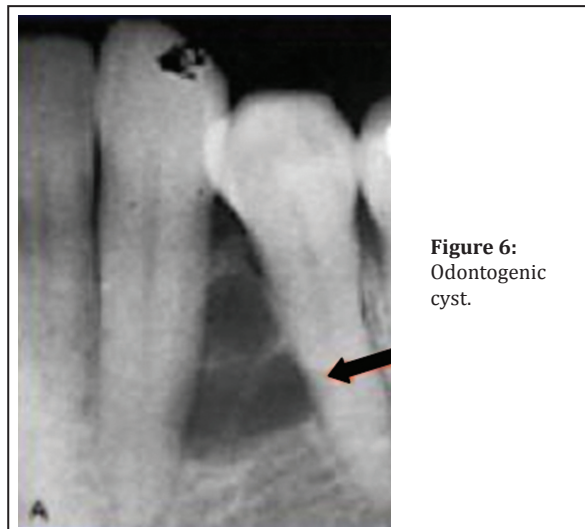


Figure 6: Odontogenic cyst.

Incisive canal cyst

It is also called median anterior maxillary cyst or nasopalatine duct cyst. It is located near the incisive canal, arising from proliferation of epithelial remnants of the nasopalatine duct and is the most common maxillary developmental cyst. Radiologically, the size varies from few millimetres to 1centimetre. It is lucent and doesn't contain any calcific material (Figure 7). It may be round or oval in shape.

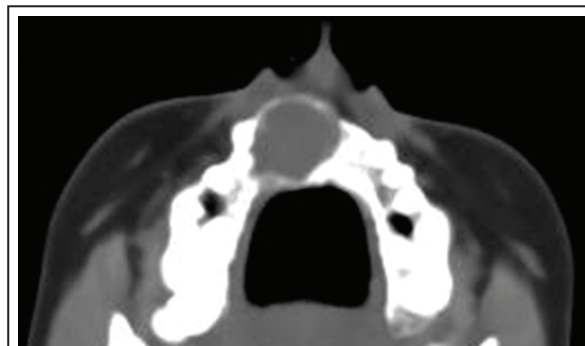


Figure 7: Incisive canal cyst.

Ameloblastoma

Ameloblastoma is the most frequent odontogenic neoplasm. It occurs most often in the mandible, particularly posteriorly. The common type of ameloblastoma is the conventional or solid-multicystic type. The most common pattern is follicular. The classical imaging appearance is a multiloculated (80%), expansile "soap-bubble" lesion with well demarcated borders and without matrix calcification (Figure 8a-d). Occasionally erosion of the adjacent tooth roots can be seen

which is highly specific. When larger, it may also erode through cortex and extend into adjacent soft tissues. Although histologically four types have been described, it is difficult to differentiate them imageologically.

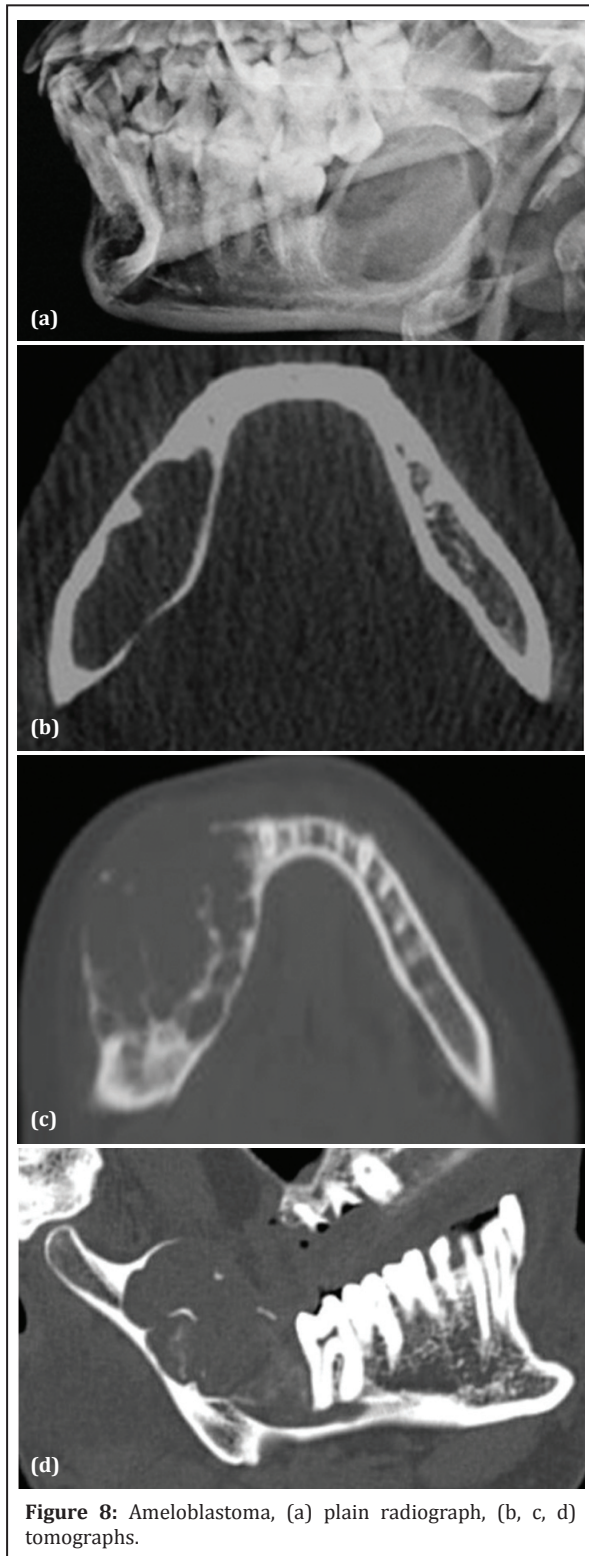


Figure 8: Ameloblastoma, (a) plain radiograph, (b, c, d) tomographs.

Fibrous dysplasia of the jaws

It is most common skeletal dysplasia and can be monostotic, polyostotic and may be associated with other syndromes. Cherubism is considered to be a variant of fibrous dysplasia, but it is a distinct entity. Clinically, it presents as a symmetrical bilateral jaw swelling with angelic facies. Radiologically, the features include lucent expanded regions within the maxilla and mandible, with soap-bubble appearance (Figure 9 a,b). As age advances, it may

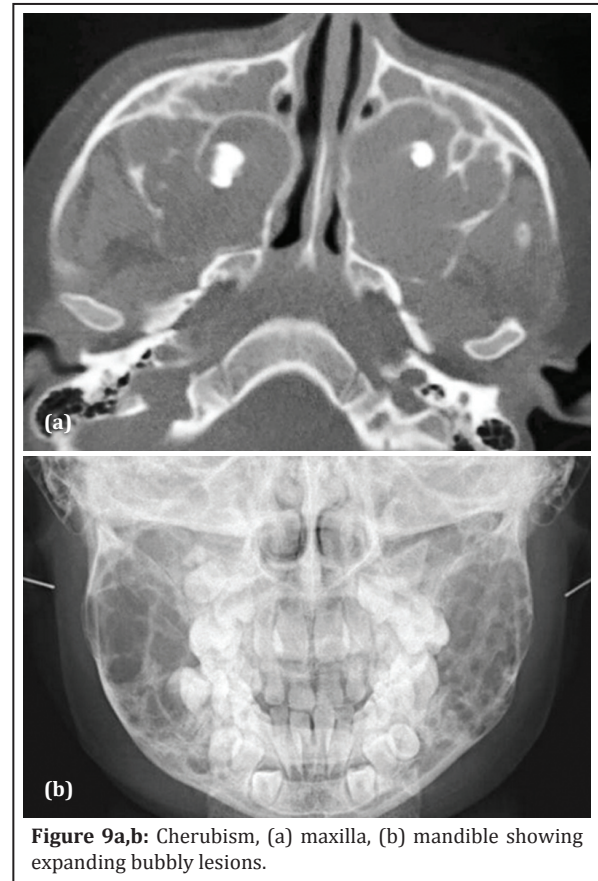


Figure 9a,b: Cherubism, (a) maxilla, (b) mandible showing expanding bubbly lesions.

become sclerotic and may reduce in size. Fibrous dysplasia of the maxilla and mandible may be part of generalized skeletal fibrous dysplasia. Isolated cases of fibrous dysplasia of jaws are rare. The radiological appearances vary. However, the classical appearance is a cystic lesion with well defined sclerotic rind, with a groundglass matrix of variable densities (Figure 9c).

Ossifying fibroma

Ossifying fibroma is also known as cementifying fibroma. It consists of fibrous tissue with variable amounts of bony trabeculae. Two clinicopathological

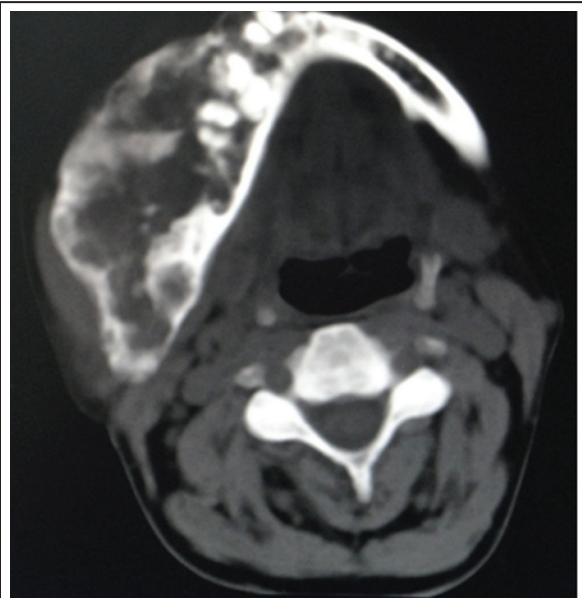


Figure 9c: Fibrous dysplasia of the mandible.

variants are known, a conventional slow growing ossifying fibroma which are encountered in 3rd and 4th decades of life and an aggressive juvenile ossifying fibroma in early years. Most of these lesions are located in the posterior part of the mandible. Radiologically, a well encapsulated circumscribed lesion with variable radio density is present. It may be completely radiolucent or completely sclerotic or with mixed densities (Figure 10).



Figure 10: Ossifying fibroma of the mandible.

Giant cell tumor and giant cell reparative granuloma

Giant cell tumor is common in long bones and is a benign neoplastic process. Occurrence in the jaws is very rare. However, giant cell reparative granuloma

is a little more common than giant cell tumors of the jaws. It is an aggressive proliferative intraosseous lesion consisting of fibrous tissue, hemorrhage and giant cells and is more common in young girls. This is often found in the anterior part of mandible and is central. Radiologically, early lesion appears as a small well defined radiolucent lesion simulating odontogenic cyst. Later it appears as a multilocular lucent lesion with tiny bony trabeculae traversing the lesion (Figure 11). It is difficult to differentiate it from giant cell tumor and odontogenic tumors.



Figure 11: Giant cell reparative granuloma of the mandible.

Brown tumor

The name derives from the cross sectional appearance of this lesion which is brown because of the hemorrhage mixed with fibroblasts and giant cells. They are common in primary and secondary hyperparathyroidism. They can occur anywhere, although it is unusual in the jaw bones. The diagnosis is confidentially made by added finding of the absence of lamina dura of the teeth (Figure 12).



Figure 12: Brown tumors of primary hyperparathyroidism.

Hemangioma

It is the most common benign vascular tumor of the bones. Although, it is common in the vertebral bodies, but can occur in any bone. Hemangioma of the jaw bones is rare. Radiologically, a spoke wheel appearance with thickened trabeculae is common. These may be capillary, cavernous, mixed or venous (Figure 13a, b).

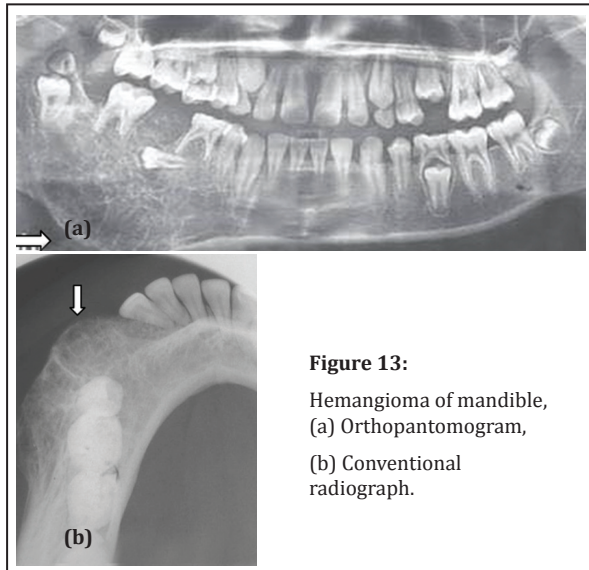


Figure 13:
Hemangioma of mandible,
(a) Orthopantomogram,
(b) Conventional
radiograph.

Periapical cyst

Periapical cyst is also known as radicular cyst, is the most frequent cystic lesion related to teeth and results from infection of the tooth. On imaging, they generally present as round or pear-shaped, unilocular, lucent lesions in the periapical region, measuring <1 cm. This is also called periapical granuloma (Figure 14a). This should be differentiated from tooth abscess (Figure 14b).

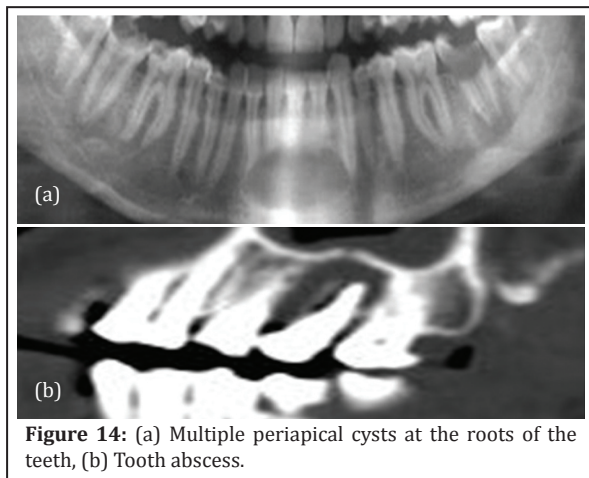


Figure 14: (a) Multiple periapical cysts at the roots of the teeth, (b) Tooth abscess.

Traumatic bone cyst (TBC)

It is also known as simple cyst or hemorrhagic cyst. This is an uncommon non-epithelial lined lucent cavity of the jaws. The lesion is mainly diagnosed in young patients most frequently during the second decade of life. The majority of TBCs are located in the mandibular body between the canine and the third molar.

Stafne cyst

Stafne cyst is also known as "lingual salivary gland inclusion defect". It is a cortical defect near the angle of mandible below the mandibular canal (Figure 15).

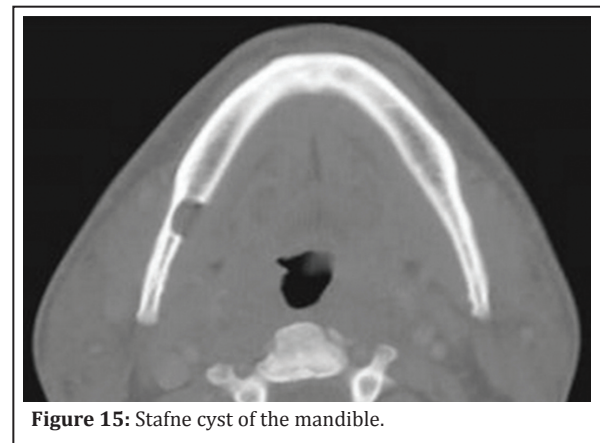


Figure 15: Stafne cyst of the mandible.

Langerhans cell histiocytosis is a complex syndrome with three subtypes, 1. Eosinophilic granuloma, 2. Hand-schuller Christian disease and 3. Letterer-siwe disease. It is a rare multi system disease and the incidence in India is not known. This term is replaced by the older term, Histiocytosis X. The etiology is unknown although, various theories have been proposed. Of these, eosinophilic granuloma is common. It may be monostotic or polyostotic and may occur at any age. Skull and jaw bones are common sites. Radiologically, a lucent lesion with bevelled edges and floating teeth are common manifestations (Figure 16a, b).

Aneurysmal bone cyst (ABC)

This may be primary or secondary most commonly seen in metaphyses of long and flat bones. These rare jaw lesions are encountered in the body and ramus of the mandible. It is commonly reported in the second and third decades of life, ABC's are characterized by a rapid growth pattern with resultant bony expansion

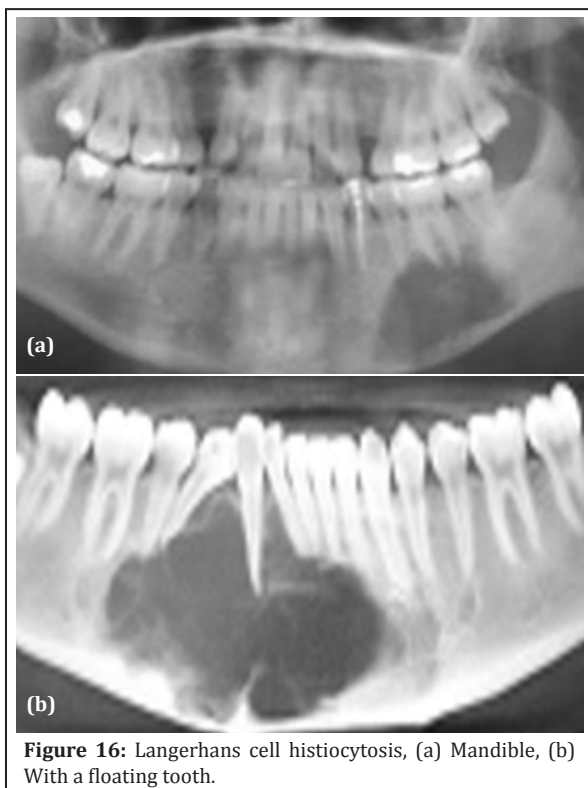


Figure 16: Langerhans cell histiocytosis, (a) Mandible, (b) With a floating tooth.

and facial asymmetry. A large lucent lesion without any mineralisation of the matrix is a common feature (Figure 17). In secondary ABC's, the benign primary lesions include giant cell tumor, osteoblastoma and chondroblastoma. On CT and MRI imaging, the presence of fluid fluid levels is characteristic.

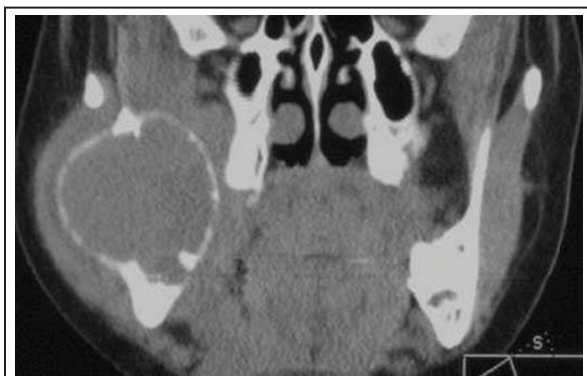


Figure 17: Aneurysmal bone cyst of mandible.

Conclusion

Cystic and predominantly lucent lesions of the jaws are relatively common. They may be odontogenic or non-odontogenic. Imaging characteristics of these are described in detail. Conventional radiology, orthopantomogram, CT and coned beam CT are

the usual methods to arrive at a diagnosis. Cyst like lesions are many and their imaging findings are also described.

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NIMS, Hyderabad, and Krest Museum, Shaikpet, Hyderabad, India.

Conflicts of interest

Author declares no conflicts of interest.

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