Ameloblastoma

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Abstract

It is a benign Odontogenic tumor of epithelial origin. It has no established preventive measures . Majority of patients are between ages 3rd and 6th decade. Treatment of ameloblastoma is focused on surgical resection with a wide margin of normal tissue because of its high tendency for locoregional invasion ; but this is often associated with significant patient death rate.The relatively high reccurence rate of ameloblastoma is determined by the type of molecular causative factors,the management approach and how early the patient seek for treatment.

INTRODUCTION

Ameloblastoma, is derived from the English word "Amel" which means enamel and the Greek word "Blastos" which means the germ. Its orgin is from the epithelium of the dental lamina, and it is characterized by its local aggressive behavior and high reccurrence rate.

Ameloblastoma was first explained in 1827 by Cusack. In 1885, Malassez proposed the name "Adamantinoma," used to describe a rare form of bone cancer described by Fisher in 1913. It was first explainedby Falkson in 1879. The term ameloblastoma was put forward by Ivey and Churchill in 1930, It is recognized as a true neoplasm .

It was explained by Robinson in 1937, as a benign tumor that is -usually unicentric, non-functional, intermittent in growth, anatomically benign and clinically persistent." The World Health Organization (WHO)-1991 defined ameloblastoma as a benign but locally aggressive tumor with a high probability to reccur, consisting of proliferating odontogenic epithelium lying in fibrous stroma.

It is a neoplasm of odontogenic epithelium, of enamel organ-type tissue that has not undergone differentiation to hard tissue formation. It accounts for about 1% of all oral tumors and 9-11% of odontogenic tumors. It is a slow-growing tumor and invasive. Its pak incidence is in 3rd to 4th decades of life. No sex predilection. Its incidence was 0.31 cases/million in a white population of South Africa. It accounts for 60.3% of all odontogenic tumors in Indian population, with a mean age of presentation of 30.2 years. More common in the mandibular molar-ramus area.

They are classified as:

- Unicystic
- Multicystic / solid.

Ameloblastoma in the mandible can grow to great size and cause facial asymmetry, displacement of teeth, malocclusion, and pathologic fractures.

CLASSIFICATION

Ameloblastoma is classified, according to WHO and the International Agency for Research on Cancer, 2003, as a benign tumor with odontogenic epithelium, mature fibrous stroma and without odontogenic ectomesenchyme. Ameloblastoma is further classified into:

- Solid/multicystic
- Extraosseous/peripheral
- Desmoplastic ameloblastoma
- Unicystic

SOLID AMELOBLASTOMA

The solid or multicystic ameloblastoma is a benign epithelial odontogenic tumor of the jaws. It is slow-growing tumor, locally aggressive. It accounts for about 10% of all odontogenic tumors in the jaw. Solid multicystic ameloblastoma occurs as growths arising from the remnants of odontogenic epithelium, mainly from rests of dental lamina. SMAs may also occurs as a result of neoplastic changes in the lining or wall of a nonneoplastic odontogenic cyst, in particular dentigerous and odontogenic keratocysts. Signaling pathway such as WNT, Akt and growth factors like fibroblast growth factor play a significant role in the pathogenesis of solid type of ameloblastoma. Proteins mainly bone morphogenic protein ameloblastin, enamel matrix proteins calretinin, syndecan-1 and matrix metalloproteinases plays an important role in the etiopathogenesis. Tumor suppressor genes p53, p63 and p73 bring molecular changes in the pathogenesis of ameloblastoma. p53 gene plays an important role in the differentiation and proliferation of odontogenic epithelial cells. MMP, triggers mitogens to be released, leading to the proliferation of ameloblastoma cells. Compared to unicystic it is multilocular in nature.

CLINICAL FEATURES

Morecommon in young adults, with median

age of 35 years. No sex predilection. Almost 80% of ameloblastomas occurs in the mandibular posterior region. The lesions grow slowly, locally invasive and infiltrates through the medullary spaces. It erodes cortical bone. If left untreated, resorption of the cortical plate occurs and extend into adjacent tissue. Crepitation or eggshell crackling might be induced in posterior maxillary tumors. This might obliterate the maxillary sinus and extend intracranially.

RADIOGRAPHIC FEATURES

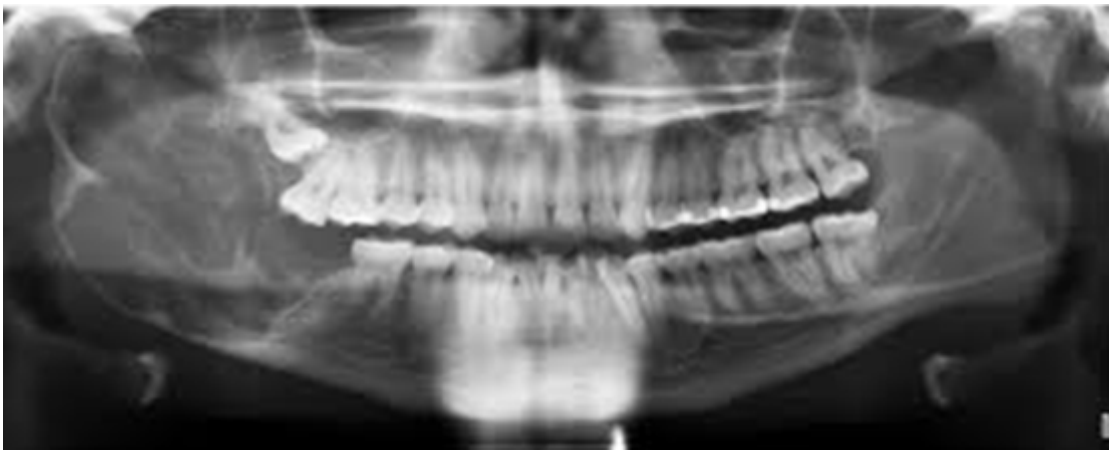
Radiographically solid ameloblastoma show an expansile, radiolucent, multiloculated cystic lesion, with a characteristic "soap bubble-like" appearance. Other findings such as cystic areas of low attenuation with scattered regions representing soft tissue components. Thinning and expansion of the cortical plate occurs with erosion through the cortex, with the associated unerupted tooth displaced and resorption of the roots of adjacent teeth occurs.

HISTOLOGICAL FEATURES

Six histopathologic subtypes of solid ameloblastoma namely granular, desmoplastic follicular, plexiform, acanthomatous, basal cell & ameloblastoma. Mixed histological patterns often observed, and the lesions are mainly classified based on the predominant pattern present. The follicular pattern type has highest recurrence rate and acanthomatous type having the least recurrence rate, and the rate of recurrence depends on the histologic varients. A prominent budding growth pattern with small, rounded extensions of epithelium projecting from larger islands were seen, which summerizes the various stages of enamel organ formation. The classical histological pattern of ameloblastoma was described by Vickers and Gorlin, which is characterized by peripheral layer of tall columnar cells with hyperchromasia, reverse polarity of nuclei and formation of sub-nuclear vacuole .

Follicular type contain many small islands of peripheral layer of cuboidal or columnar calls with reversely polarized nucleus. Follicular type commonly shows cyst formation. The term plexiform refers to the appearance of anastomosing islands of odontogenic epithelium, with two rows of columnar cells. In acanthomatous type, the cells in the position of stellate reticulum undergo squamous metaplasia, with keratin pearl formation in the center of tumor islands. In granular cell ameloblastoma, cytoplasm of stellate reticulum-like cells seen as coarse granular and eosinophilic. In basal cell type, the epithelial tumor cells are arranged in sheets and less columnar. Desmoplastic variant is consist of dense collagen stroma, that appears hypocellular and hyalinized.

Other histological types include papilliferous-keratotic type, clear cell type, and mucous cell differentiation type. Solid ameloblastomas contain clear, PAS positive cells most often



localized to the stellate reticulum-like areas of follicular SMA. Keratoameloblastoma consists partly of keratinizing cysts and partially of tumor islands with papilliferous appearance. Mucous cell type of ameloblastoma presents focal mucous cell differentiation, with vacuolated mucous cells.

DIFFERENTIAL DIAGNOSIS

CLINICAL

It should be differentiated from the lesions which are painless, longstanding, firm to bony hard swell in without any pulp or periapical disease such as keratocystic odontogenic tumour.

RADIOLOICAL

Odontoenic myxoma

Aneurysmal bone cyst

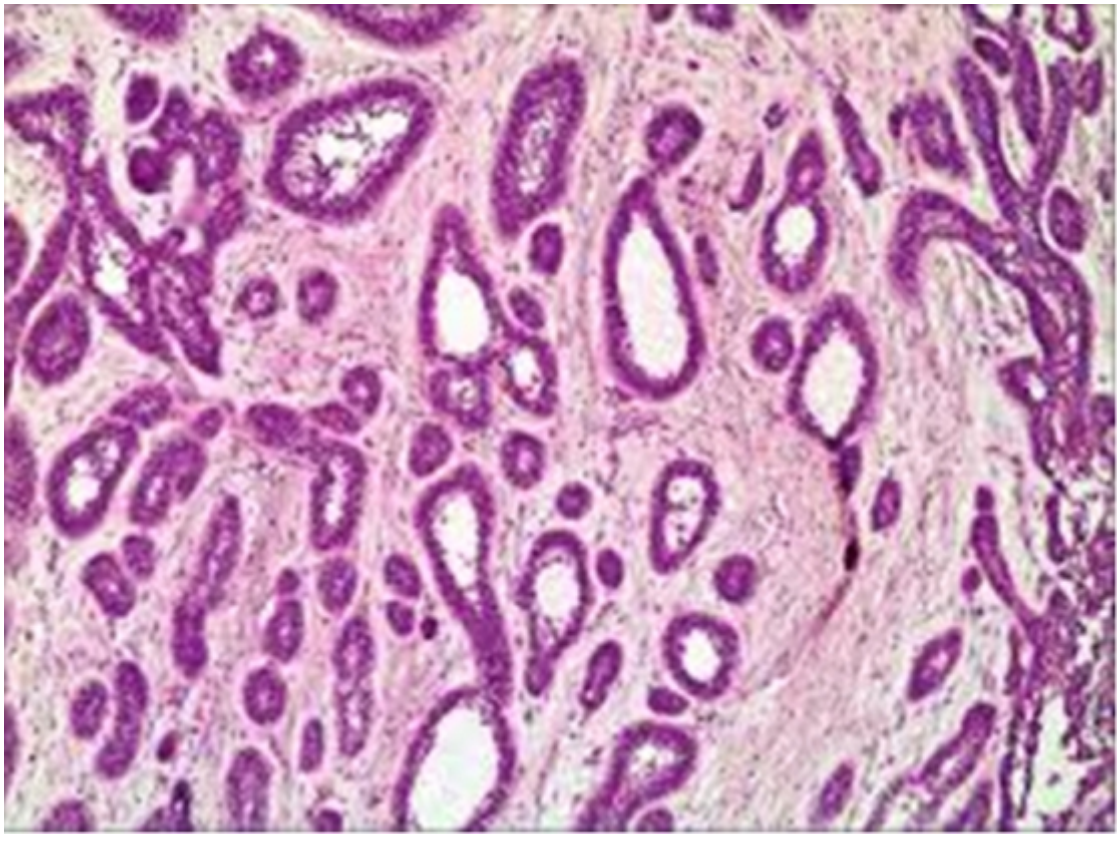
Central hemanioma of bone

TREATMENT

The main mode of treatment is surgery, with wide resection recommended due to the high recurrence rate of solid/multicystic ameloblastomas. The recurrence rate after resection is 13-15%, as opposed to 90-100% after curettage. Recommend a margin of 1-2 cm beyond the radiological limit is implicated to ensure all daughter cyst are removed.

PERIPHERAL AMELOBLASTOMA

The peripheral ameloblastoma is defined as an ameloblastoma that is confined to the gingival or alveolar mucosa. It infiltrates mostly the gingival connective tissue, but it does not involve the underlying bone. The PA arises from remnants of the dental lamina, the so-called "glands of Serres," odontogenic remnants of the vestibular lamina, pluripotent cells in the basal cell layer of the mucosal epithelium and pluripotent cells from minor salivary glands.



CLINICAL FEATURE

The PA is an exophytic growth restricted to the soft tissues covering the tooth-bearing areas of the jaws, the initial diagnosis often mistaken for fibrous epulis. In the majority of cases, there is no radiological feature of bone involvement, but a superficial bone erosion called as cupping or saucerization may be noticed at surgery. The average age is 52 years, slightly higher for males than for females. The male to female ratio is 2 : 1, as opposed to 1.2 : 1 for the solid type. The maxilla/mandible ratio is 1 : 3. The mandibular premolar region accounts for 33% and is the commonest site.

HISTOLOGICAL FEATURE

Histologically same patterns are as in solid type, with a common type being acanthomatous. Differential diagnosis includes peripheral reactive lesions such as pyogenic granuloma, epulis, papilloma, fibroma, peripheral giant-cell granuloma, peripheral odontogenic fibroma, peripheral-ossifying fibroma, Baden's odontogenic gingival epithelial hamartoma, and basal cell carcinoma.

TREATMENT

The PA is mostly treated with a wide local excision. 9% of recurrence following treatment has been reported, though malignant transformation is rare, metastasis has also been reported.

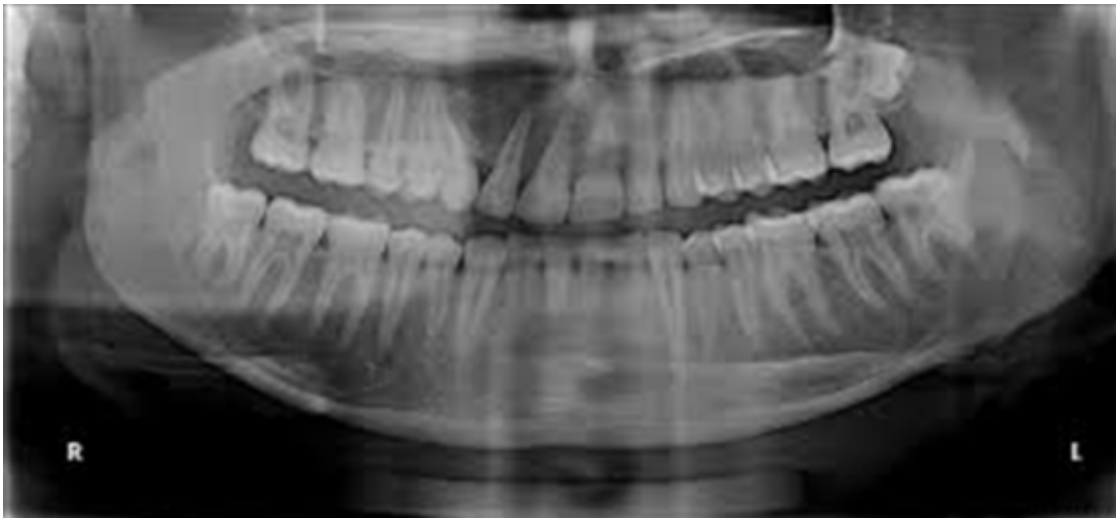
DESMOPLASTIC AMELOBLASTOMA

Eversole et alwas first to report Desmoplastic ameloblastoma in 1984. It was recently included in the WHO's classification of head and neck tumors (WHO-2005). This tumor is characterized by an unusual histopathology, including extensive stromal collagenization or desmoplasia, leading to the proposed term ameloblastoma with pronounced desmoplasia.

RADIOGRAPHIC FEATURES

Radiographically it produces mixed radiolucent - radioopaque lesion with diffuse border indicates that the tumor is more aggressive than other variants of ameloblastoma. Mixed radiologic appearance expresses the infiltrative pattern of the tumor and when the DA infiltrates the bone marrow spaces, remnants of the original nonmetaplastic or nonneoplastic bone were found to remain in the tumor tissue. The infiltrative behavior explains one of the characteristic features of the tumor, the ill-defined border.

It appears as a poorly defined, mixed, radiolucent-radiopaque lesion mimicking a benign fibro-osseous lesion, especially when evaluating panoramic and periapical radiographs.



HISTOLOGICAL FEATURES

Histologically DA appears as irregularly shaped odontogenic epithelial islands surrounded by a narrow zone of loose-structured connective tissue embedded in desmoplastic stroma.

TREATMENT

About 16% rate of recurrence has been reported in DA cases treated by enucleation and curettage, with an average recurrence period 36.9 months. The majority of DA cases reported is treated by resection and most likely due to ill-defined bordersand consequently suggesting an infiltration process and aggressive biological charecter.

UNICYSTIC AMELOBLASTOMA

Unicystic ameloblastoma (UA) represents an ameloblastoma variant that presenas a cyst showin clinical and radiologic features of an odontogenic cyst. The histologic examination reveal a typical ameloblastomatous epithelium lining part of the cyst cavity, with or without luminal or mural tumor proliferation. In 1977, Robinson and Martinez first used the term "Unicystic ameloblastoma" it was also named in the second edition of the international histologic classification of odontogenic tumors by the WHO as "cystogenic ameloblastoma". 5-15% of all ameloblastomas are of unicystic type.

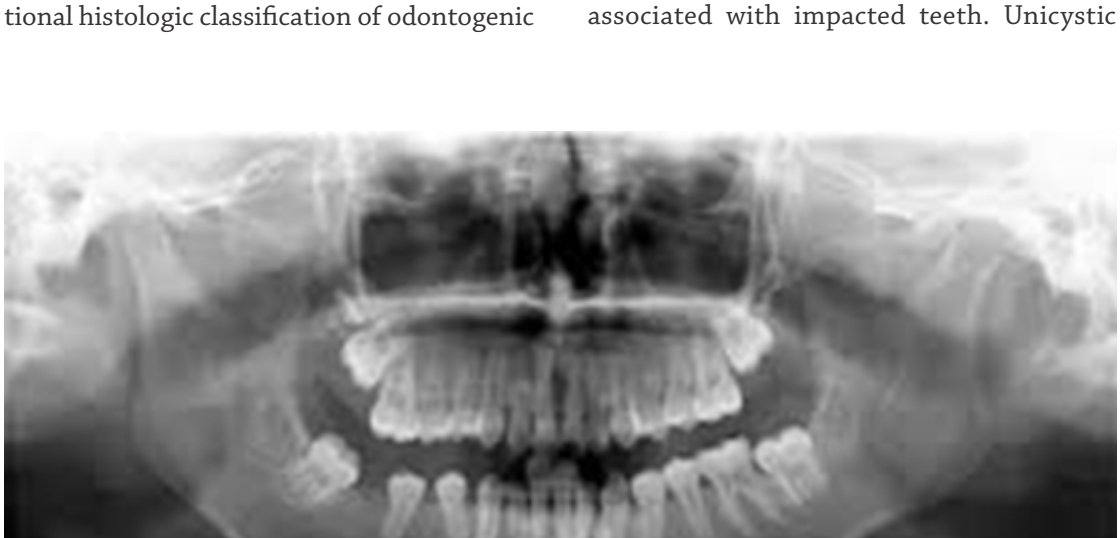
CLINICAL FEATURE

5 - 15% of all ameloblastomas are of unicystic type. Unicystic ameoblastoma with an unerupted tooth occurs in a mean age of 16 years as opposed to 35 years in the absence of an unerupted tooth. The mean age is lower than that for solid/multicystic ameloblastoma and there is no gender predilection. Unicystic ameloblastoma is a prognostically distinct entity and has a recurrence rate of 6.7-35.7%, the average interval for recurrence is approximately 7 years.

Three pathogenic mechanisms for the evolution of Unicystic ameloblastoma are Reduced enamel epithelium, dentigerous cyst and cystic degeneration of solid ameloblastoma.

RADIOGRAPHIC FEATURES

Six radiographic patterns are identified for Unicystic a Ameloblastoma, ranging from well-defined unilocular to multilocular ones. there is an apparent predominance of a unilocular configuration in all studies of Unicystic ameloblastoma, especially in cases associated with impacted teeth. Unicystic



ameloblastoma might mimic other odontogeic cysts clinically and radiographically.

HISTOLOGICAL FEATURES

Histopathological classification of Unicystic Ameloblastomas are:

- Luminal unicystic Ameloblastoma
- Luminal and intraluminal Unicystic ameloblastomas
- Luminal, intraluminal, and intramural Unicystic Ameloblastomas
- Luminal and intramural Unicystic Ameloblastomas.

TREATMENT

Treatment of Unicystic Ameloblastoma includes :

- radical and conservative surgical excision
- curettage
- chemical and electrocautery
- radiation therapy
- combination of surgery and radiation.

CONCLUSION

The Ameloblastomas are usually of late diagnosis because of its poor symptoms and low prevalence. Its treatment mainly includes the resection with safety margins and immediate reconstruction whenever possible. Routine histological classification of the ameloblastoma is compulsory for its morphological characterization and, thus, a better treatment definition. The main success factor associated with the treatment is the early diagnosis and to correlate the histopathologic features with clinical and radiographic features to achieve at a correct definitive diagnosis as all such lesions might have prognostically different biologic behaviors and the final diagnosis may alter the therapeutic decision significantly.

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