An Insight into cytopathology of odontogenic tumors: A review

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ABSTRACT
Odontogenic tumors represent a spectrum of lesions ranging from dental hamartomas to malignant and benign neoplasms, all arising from odontogenic residues thereby present as jaw tumors. Occasionally an odontogenic tumor develops from a preexisting developmental cyst such as dentigerous cyst or dental primordium. Fine needle aspiration cytology has been used as a diagnostic tool in evaluating suspected lesions. Fine needle aspiration cytology (FNAC) of jaw tumors has not been studied extensively. Odontogenic tumors show a wide morphologic spectrum and thus may pose some diagnostic difficulties. Available literature on cytopathology of odontogenic tumors was reviewed including the latest publications. A literature review on cytopathology of odontogenic tumors with the most common odontogenic tumor ameloblastoma and uncommon odontogenic myxoma has been discussed.

Key words: Odontogenic tumors, fine needle aspiration cytology (FNAC), cytopathology

INTRODUCTION
Ameloblastoma is the most common epithelial odontogenic tumor, comprising 1% of tumors and cysts arising in the jaws. Available literature on ameloblastoma of the jaw reports with an average age of patients is 36 years. In developing countries ameloblastomas occur in younger patients. Men and women are equally affected. Women are 4 years younger than men when ameloblastomas first occur and the tumors appear to be larger in females. Dominant clinical symptoms such as painless swelling and slow growth are non-characteristic. The ratio of ameloblastoma of the mandible to maxilla is 5:1. Ameloblastomas of the mandible occur 12 years earlier than the maxilla. Ameloblastomas occur most frequently in the molar region of the mandible. In Blacks, ameloblastomas occur more frequently in the anterior region of the jaws. Radiologically, 50% of the ameloblastomas appear as multilocular radiolucent lesions with sharp delineation. Histologically, one-third are plexiform, one-third follicular; other variants such as acanthomatous ameloblastomas occur in older patients. Two percent of ameloblastomas are peripheral tumours. Unicystic ameloblastomas occurring in younger patients have been found in 6%. Cystic ameloblastomas occur with a wide age range, but at a slightly lower mean age than solid lesions. There is very strong predilection for the
mandible, and there appears to be no gender difference. Lesions frequently become large, destructive, and multilocular.  

Fine-needle aspiration biopsy (FNAB) is a technique in which a fine needle is introduced into a mass, cellular material is aspirated, and a cytological diagnosis is rendered. It separates reactive and inflammatory processes that do not require surgical intervention from neoplasia and benign from malignant tumors. Fine needle aspiration biopsy lends itself to the diagnosis of palpable head and neck masses, in particular, those that persist following antibiotic treatment. The prudent use of these techniques can be cost-effective and negate the need for more invasive diagnostic procedures. FNAB represents a cost-effective and rapid technique for the assessment of nodules and masses within the head and neck. Fine needle aspiration biopsy provides accurate diagnosis of most salivary gland lesions and contributes to conservative management in many patients with non-neoplastic conditions.

A survey of studies on FNAC shows a high diagnostic accuracy for the lesions of salivary gland, thyroid, parathyroid, lymph node, skin, soft tissue and bone. FNAC has been used rarely as a diagnostic tool in odontogenic tumors and cysts.

**DISCUSSION**

A few reports of ameloblastoma and ameloblastic carcinoma diagnosed by FNAC have appeared in the literature. Husain A Saleh et al (2008) reported a relatively small series of FNAC of intraoral and oropharyngeal lesions, where a few ameloblastoma cases were accurately diagnosed. Attention to the palisading arrangement of ameloblast like epithelial cells (figure 1) and digitated, stellate reticulum-like cells may lead to the diagnosis of ameloblastoma. Ameloblastomas can be aspirated easily, and the cytologic features may be sufficiently distinctive.

![Figure 1. Cytological smear shows clusters of odontogenic islands with nuclei having palisading arrangement resembling ameloblast-like epithelial cells.](image)

Radhika S et al reported cases showed cytopathologically tightly packed clusters of basaloid epithelial cells with palisading. They also reported squamous differentiation in all cases but was marked in one case as larger cells with central nucleus and abundant cytoplasm showing keratohyaline granules and whorls.

Another study Mathew S et al reported a distinct, two-cell population consisting of small, hyperchromatic, basaloid-type cells and scattered larger cells with open chromatin. Occasional fragments of mesenchymal cells with more elongated nuclei and ample, clear cytoplasm were also noted. Malignant cases that metastasized showed prominent cytologic pleomorphism, cellular crowding with molding and a high mitotic/karyorrhexis index.

The differential diagnosis of ameloblastoma on cytology includes mucoepidermoid carcinoma, adenoid cystic carcinoma, myxomas, giant cell lesions and pilomatrixoma. Ameloblastomas with cystic change may provide samples with myxoid background material, abundant macrophages and leukocytes without lesional cells indicative of cystic degeneration.
Acanthomatous ameloblastoma is a rare jaw tumor but it possesses distinctive cytological features showing combinations of basaloid cells with peripheral palisading, stellate cells as well as squamous cells in groups and in isolation.²²

Ravindra Kumar Saran et al outlined cytologic features of desmoplastic ameloblastoma. They described two populations of cellular elements: cohesive epithelial clusters with basaloid morphology, mostly in bidimensional, irregularly outlined clusters with ill-formed palisading of nuclei at the periphery and a mesenchymal component represented by a sparse chunk of moderate-sized tissue fragments made up of spindle- or ovoid-shaped nuclei entrapped in mesenchymal matrix, and many dissociated naked oval-to-spindle shaped nuclei.²³

Of many types ameloblastoma, granular cell ameloblastoma is a uncommon variant that possesses distinctive features. There are very few reports on cytologic findings of granular cell ameloblastoma. Deshpande et al noted characteristic granular cells along with spindle and basaloid cells.²⁴ Reviewing two malignant cases Mathew et al noted a greater degree of atypia, hyperchromasia, pleomorphism, and crowding than in benign ameloblastoma. The nuclei were ovoid to elongated and showed frequent overlapping. A high mitotic/karyorrhexis index was noted. Nuclear molding was conspicuous and prominent nucleoli were often evident. The cytological findings of Parate SN et al were in marked contrast with those of Mathew et al. Although the clinical presentation showed metastasis but the cytologic findings could not suffice the label of malignant tumor. Features suggestive of malignancy such as pleomorphism and mitotic figures were not prominent in the smears. Similar problems were encountered with Sharma et al. in their case of malignant ameloblastoma. They stated that high cellularity or mild-to-moderate pleomorphism can also be seen in cellular and recurrent ameloblastoma.²⁵ Concerning clinical diagnosis, ameloblastoma was mistaken mostly (56.41%) for odontogenic cysts.²⁶

Calcifying epithelial odontogenic tumor is a rare odontogenic neoplasm, first described by Jens Pindborg in 1955, that accounts for 3% of all odontogenic neoplasm and usually follows an indolent clinical course. It affects the mandible (posterior segment) more than the maxilla and is frequently associated with unerupted teeth or dentigerous cyst. It has a mild tendency to recur, even after prolong periods of time and very rarely unequivocal malignant variants have been reported in elderly patients. It is composed of characteristic epithelial cells, growing in sheets with prominent intercellular bridges, surrounded by variable amounts of amyloid substance and calcifications. Sometimes the latter are arranged in concentric lamellae and interspersed within the epithelial cells (Liesegang rings).

There are very few reports dealing with cytomorphology of CEOT, showing sheets of pleomorphic cells and amorphous material, surrounded by fibroblasts and occasional calcifications. Eugenio Maiorana et al cytological preparations were characterized by large clusters of scarcely cohesive, large polyhedral cells and abundant calcified material. The latter consisted of intensely basophilic substance either in large clusters or discrete concretions, and at high power view, occasional tumor cells also contained calcified material. They concluded that cytological features of CEOT are rather characteristic, and the detection of intra- and extracellular calcifications may help to differentiate this neoplasm from others that most commonly arise in this area.²⁷

Franco Fulciniti et al cytologic smears of CEOT were characterized by clusters, sheets, and rare isolated pleomorphic cells of the squamoid type, blocks of amorphous material encircled by fibroblasts, and occasional calcifications.²⁸ CEOT occurs rarely in the maxilla and lacks classical clinicoradiologic features. The cytological features in conjunction with the radiologic picture can be helpful in making a preoperative diagnosis and guiding management.²⁹

Ameloblastic fibroma of the jaw is a rare, benign mixed odontogenic tumor, having little tendency for local invasion and a low recurrence rate. Cytologic distinction from ameloblastoma, ameloblastic fibrosarcoma, and intraosseous adenoid cystic carcinoma is necessary, in view of the different
biologic behavior. Kumar N and Jain S outlined the cytopathology of ameloblastic fibroma. They reported sheets of small monomorphic epithelial cells with peripheral palisading by columnar cells. The striking feature was central hyaline globules in some tubules.

Myxoma of the jaw is a rare benign tumor that has a tendency for bone destruction, invasion into surrounding structures, and a relatively high recurrence rate. Maxillary myxoma is less frequent but behaves more aggressively than in the mandible, as it spreads through the maxillary sinus. Neeta Kumar et al described the cytological smears were hypocellular. The striking feature was abundant myxoid material with a few monomorphic oval cells. Cytologically it should be differentiated from other tumors showing predominant myxoid change. Awareness of potential diagnostic pitfalls and careful evaluation of clinical and radiological data is necessary to narrow the differential diagnosis.

Ameloblastic fibrosarcoma is an unusual malignant odontogenic tumor. Gupta N et al described cytopathology of ameloblastic fibrosarcoma. The aspiration of the tumor yeilded a cellular sample composed predominantly of mesenchymal element and few clusters representing epithelial component showing tall columnar cells with peripheral palisading.

CONCLUSION
In summary, we have discussed the cytopathology of the odontogenic tumors based on the available literature. FNAC technique is simple, inexpensive, convenient and comfortable to the patient, and above all, can offer a rapid and accurate diagnosis and also helps in narrowing the differential diagnosis. Since cytological studies are very few regarding odontogenic tumors more studies have to be done.

REFERENCES
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