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Review Article

Meta-terminology of Ameloblastoma

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Abstract

One of the primary tasks of systematic biology is the development of our biological nomenclature and classifications. The key purpose for the development of a standard nomenclature for a disease is the need for a common language for the statement of diagnostic terms and for a means or system whereby diagnosis could be suitably recorded without chaos. Odontogenic tumor nomenclature and classification have confused physicians over the years. Ameloblastoma is one such entity among odontogenic tumors, which has continuously changed to be an evolution of the terms and taxonomy used in literature. In this review, we aim to provide a fundamental basis for the understanding of how the etymology and the position of ameloblastoma in odontogenic tumor classification have evolved over the years.

Keywords: *Ameloblastoma, nomenclature, odontogenic tumor*

Introduction

Ameloblastoma, an epithelium-derived odontogenic tumor, has an origin from the prehistoric era. The evidence of a few ancient diseases can be investigated through the archaeologically obtained skeletons and they depict the overall health status of the societies in the past.[1] Millions of years ago, the researchers have discovered miniature toothlike structures. It was studied in the group of animals called Gorgonopsians. They are also called as synapsids, which include modern mammals and mammal-like reptiles. Whitney and Larry Mose were the paleontologists who investigated and revealed that the fossils of these groups of creatures depict the presence of many tooth lets.[2] This elucidates the finding that odontogenic tumors had existed even millions of years ago.[3]

A dinosaur fossil with an expansile jaw tumor, estimated to be 67–69 million years old (Cretaceous period), was discovered in western Romania. X-ray micro-CT scanning of the jaw specimen was conducted. A locally lytic density was observed in the cortical bone and ventral edge of exostosis. A detailed x-ray micro-CT scanning of the two jaw rami revealed features such as expansile multilobulated cystic or mixed cystic and solid areas with cortical thinning. Internal septations gave a honeycomb-like or soap bubble–like appearance; the location, external appearance, and internal structure

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of the lesion indicate the diagnosis of ameloblastoma in Telmatosaurus.[1]

A fossil of a horse dated to 500,000 years ago was found with odontoma. In a similar way, a mandible of Egyptian mummy dating back to 2800 BC was found with all the features of ameloblastoma. Because the occurrence is from prehistoric age, there are a considerable number of changes in the nomenclature, classification, and the position of ameloblastoma among odontogenic tumors over the years. The aim of this review is to provide a fundamental basis for understanding how the etymology and the position of ameloblastoma in odontogenic tumor classification has evolved over the past centuries.[4]

Onomastics is the study of proper names and their origin. The practice of Health Science depends on the recognition and classification of disease. For precision in reporting diseases, a nomenclature is essential. A nomenclature is a list of acceptable or approved disease terminology and differs from a classification, which refers to systematically organized disease terms. The meta-terminology of a disease deals with philosophies of concepts, classification, nomenclature, and terminology.[5] This review provides a platform to understand the fundamental basis of evolution of the nomenclature and the position of ameloblastoma in odontogenic tumor classification over the years [Figure 1].

History of Ameloblastoma

Scultet in 1654 named the tumors of jaws as *Tumeurs liquides de la machoire*, which means liquid tumor of jaws.[4,6] Cusack in 1827 reported a case that obviously relates the features of ameloblastoma.[4,7,8]

It was Dupuytren in 1832, who described the cystic tumors of jaws as *Corps fibreux de la machoire*, which indicates the fibrous bodies of jaws. He made discrimination between osteosarcoma and the benign cystic maxillary tumors.[4,9]

In the year 1840, Forget elucidated ameloblastoma with the distinct name *Maladie kystique de machoires*, which specifies the cystic disease of the jaws.[4,10] The very first pathological examination of ameloblastoma was conducted by Wedl in the year 1853.[4,8,11]

In 1859, Forget renamed the lesion as *tumeur fibreuse*.[4,10] First detailed description of ameloblastoma was given by Broca in the year 1868. On the basis of the classification he proposed on odontogenic tumor, he termed this lesion as *odontomes embryoplastiques*, which means embryoplastic odontomas.[4,8]

The first case reported with mural ameloblastoma arising from follicular cyst was reported by Neumann in the year 1868.[4,12] In 1869, Bennecke described about the degenerative changes taking place in cylindrical cell of granular cell ameloblastoma and also explained the formation of macrocysts by the fusion of microcysts.[4,13] In 1870, Wedl termed this lesion as *cystosarcoma/colloid tumor/cystosarcoma adenoides*. [4,8] In 1871, Wagstaffe was the first person to describe ameloblastoma with histological diagram.[8] Magitot was interested in the pathogenesis of cysts of jaws and insisted hemisection in a group of cases, which were later found to be ameloblastomas.[4]

In 1876, Heath termed granular cell ameloblastoma as *Cystic sarcoma of the lower jaw*. [4,14] Falkson in 1879 gave a detailed histological appearance of follicular ameloblastoma, and suggested the term *Follicular cystoids* or *cystoma proliferum folliculare*. [4,15]

Many precise papers were published by Malassez in his study on epithelial rests found in periodontal ligament. This led to the term *epithelioma adamantin*. This was commonly accepted and he believed that ameloblastoma arose from the epithelial rests.[4,8,16]

In the year 1890, Derujinsky suggested the termed *adamantinom*.[4,17] Later, Blumm coined the familiar term *adamantinoma*.[4,8]

Churchill and Ivy in 1928 and 1932 described that the name *adamantinoma* indicates the neoplasm as calcified.[4,8] They put forward the new term that reflects the origin and histological structure. The peripheral cells were tall columnar, polarized epithelial ameloblastoma-like cells, and center of the follicles resembled stellate reticulum of the enamel organ. Churchill in 1930, based on the above histological findings, led to the birth of the current nomenclature *ameloblastoma*. It was derived from the English word "amel," which means enamel, and the Greek word "blastos," which means the germ. Robinson in 1937 described ameloblastoma as a benign tumor that is usually "unicentric, nonfunctional, intermittent in growth, anatomically benign and clinically persistent."[4,8,18,19]

Though many terminologies have been proposed after Churchill's contribution, the term ameloblastoma remains as the most acceptable term used worldwide, especially in English-speaking countries.[4] Cahn in 1938 proposed *epithelioma of the basal variety*. It was Thoma and Goldman in the year of 1946 who used the name *adamantoblastoma*, and the term *pre-ameloblastoma* was put forth by Byars and Sarnat in 1946. Willis, in the year 1948, termed it as *carcinoma of tooth germ residues* followed by Fischer and Waslas who modified it as *odontoma adamantinum*. Schulenburg in 1951 called it as *basal cell carcinoma of the jaws*. The same term was recodified as *primary basal cell carcinoma of the jaws*. The term *epithelioma*

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ameloblastoides was coined by Mathis in 1954. Finally, in the year 1957, the terms *pre-ameloblastoma metamorfo* and *pre-ameloblastoma protomorfo* were used.[4]

Several terminologies have been identified in the world literature to address ameloblastoma; however, the names of the researchers were not specified. It includes *multilocular cystic epithelial tumor, central epithelioma,*

Figure 1: Past years terminologies for ameloblastoma

S.NO	TERMINOLOGY	YEAR	AUTHOR
1	Tumeurs liquides de la machoire	1654	Scultet
2	Corps fibreux de la machoire	1832	Dupuytren
3	Maladie Kystique des machoires	1840	Forget
4	Tumeur fibreuse provenant du follicule dentaire	1859 & 1862	Robin
5	Tumeur fibreuse	1859	Forget
6	Odontome embryoplastique	1867	Broca
7	Cystosarcoma, colloid tumour, cystosarcoma adenoides	1870	Wedl
8	Cystic sarcoma, Cystic disease of the lower jaw	1876	Heath
9	Cystic adenoma	1877	Kolaczekin
10	Cystic epithelioma	1877	Busch
11	Follicular cystoids, cystoma proliferum folliculare	1877 and 1879	Falkson
12	Sarcome kystique avec cylindres epitheliaux	1882	Brasseur
13	Epithelioma adamantin	1884	Malassez
14	Enamelogenous cyst	1885	Bernays
15	Epithelial odontome	1888	Bland-Sutton
16	Epithelioma oligokystique	1888	Audry
17	Cystome central paradentaire	1889	Nasse
18	Cystodermoid	1889	Tapie
19	Adamantinom	1890	Derujinsky
20	Epithelioma adamantinum	1890	Derujinsky
21	Central solid epithelial tumour	1891	Bennecke
22	Central papilloma of the jaw	1893	Becker
23	Carcinoma adamantinum	1895	Tapie
24	Adamantinoma	1901	Blumm
25	Cystadenoma adamantinum	1902	Borst
26	Soft odontoma and multilocular cystoma	1904	Partsch
27	Central cystadenoma	1904	Pinkus
28	Pseudoadenoma adamantinum	1907	Dreybladt
29	Epithelioma adamantinummalignum & Basiloma	1917-1918	Krompecher
30	Melanotic epithelioma	1926	Mummery and Pitts
31	**Ameloblastoma**	**1929 &1932**	**Churchill and Ivy**
32	Epithelioma of basal cell variety	1938	Cahn
33	Adamantoblastoma	1946	Thoma and Goldmann
34	Preameloblastoma	1946	Byars and Sarnat
35	Carcinoma of tooth germ residues	1948	Willis
36	Odontoma adamantinum	1948	Fischer and Waslas
37	Primary basal cell carcinoma of jaws	1951	Schulenberg
38	Epithelioma ameloblastoides	1954	Mathis
39	Pre-ameloblastoma metamorfo and pre-ameloblastoma protomorfo	1957	Treves

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chorioblastoma, cystodermoid, proliferating cysts of the jaw, proliferating mandibular cyst, adenoma adamantinum, adamantinocarcinoma, adamantinosarcoma, adamantine tumor, true ameloblastic tumor, enameloblastoma, and *adamantinoblastoma*. In spite of several nomenclatures that have been used in the earlier days, ameloblastoma and adamantinoblastoma were widely accepted all over the world. The European dental and medical literature recently accepted the name *ameloblastoma*.[8]

The World Health Organization (WHO) in 1991 defined ameloblastoma as a benign but locally aggressive tumor with a high tendency to recur, consisting of proliferating odontogenic epithelium lying in fibrous stroma.[4,8,18]

Major Changes in the Classification of Odontogenic Tumor

French dentist Pierre Fauchard gave the first precise description for odontogenic tumor in 1746. An eminent French physician and a professor of pathology and clinical surgery, Broca in the year 1869, made the first attempt to classify odontogenic tumors. He used the term *odontome* for any tumor arising from the dental formative tissues and he suggested classification of the lesions according to the stage of development of the tooth when abnormal growth commenced.[20,21] From mid-nineteenth century, there was an increase in the number of reports of odontogenic tumors. Later, Louis Charles Malassez in the year 1885 came forward to make minor changes to Broca's classification leaving no obvious impact. He was the first to give description on epithelial cell rests of Malassez. In 1888, Bland-Sutton included odontogenic cysts and fibrous osteogenic tumors in his classification, but the term odontome or rather odontoma remained as the common designation for any tumor of odontogenic origin. During 1914, the British Dental Association had asked Gabel, James, and Paine to produce a report on odontomes. They further elaborated and modified Bland and Sutton's classification. Their classification recognized three main groups of odontomes, which included (1) epithelial odontomes (earlier known as *neoplastic multilocular cyst* and *non-neoplastic cyst*), which were known to arise from epithelial odontoma; (2) composite odontomes (arising from both dental epithelium and mesenchyme); and (3) connective tissue odontomes (arising from dental mesenchyme only).[4,20,21]

In 1946, Thoma and Goldmann eliminated cysts from odontogenic tumors and classified them into (1) odontogenic tumors of ectodermal origin, (2) odontogenic tumors of mesodermal origin, and (3) odontogenic tumors of mixed origin. This classification was widely accepted and established the foundation for the classification introduced by the American Academy of Oral Pathology in 1952. The term odontoma was restricted to tumors, which consist of both epithelial and mesenchymal components.[4]

Based on embryologic principles and experimental evidence, Pindborg and Clausen in the year 1958 came forward with the following classification. The tumors were divided into two groups as epithelial and mesenchymal. Depending on the ability of the epithelium to induce changes into the surrounding mesenchyme, the epithelial tumors were further subgrouped into (1) epithelial tumors without any inductive changes in the connective tissue (ameloblastoma and calcifying epithelial odontogenic tumor), and (2) epithelial tumors that do show inductive changes in the mesenchyme (ameloblastic fibroma and those characterized by the occurrence of hard dental tissue, dentinomas and odontomas).[4,8] Ameloblastoma was again classified into simple ameloblastoma and adenoameloblastoma based on tumor tissue and ameloblastohemangioma and ameloblastonurinoma based on stromal tissue. Gorlin, Chaudrhy and Pindborg in 1961, termed adenoameloblastoma as ameloblastic adenomatoid tumor and separated it from ameloblastoma classification.[4]

Many attempts have been made to bring out a logical classification of odontogenic lesions. The understanding of the origin and interactions of odontogenic tissues have provided better scientific basis for the WHO classification made in 1971 (WHO Histological Typing of Odontogenic Tumours, Jaw Cysts, and Allied Lesions, First Edition, 1971). Major changes noted in this classification are as follows:

- The unicystic variety of ameloblastoma has attracted a great deal of attention since the surgical management and the prognosis are significantly different from that of other ameloblastomas.
- The odontoameloblastoma has a structure and behavior like that of the ameloblastoma but also has an odontoma-like element, which makes it important to distinguish this neoplasm from an odontoma.[22,23]

The WHO in 1991 defined ameloblastoma as a benign but locally aggressive tumor with a high tendency to recur, consisting of proliferating odontogenic epithelium lying in a fibrous stroma. In 1992, the WHO came refined the classification (WHO Histological Typing of Odontogenic Tumours, From the Second Edition, 1992) by making few changes:

- The unicystic variety has been given specific identification since their surgical management and

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prognosis are often significantly different from that of other ameloblastomas.
- The other varieties discussed in the second editions are keratoameloblastoma and desmoplastic ameloblastoma.[20,21,24,25]

The 2005 WHO classification (WHO Histological Classification of Odontogenic Tumours, 2005) of ameloblastoma includes four subtypes:

- solid/multicystic;
- unicystic;
- extraosseous ameloblastoma; and
- desmoplastic.

Solid, unicystic and desmoplastic ameloblastoma are designated as *central ameloblastomas* because they are centered within the marrow space and encapsulated by the bone.

Peripheral ameloblastoma are extraosseous and do not involve the underlying bone.

Ameloblastic carcinomas were previously divided into three categories in the WHO 2005 classification: (1) primary type; (2) secondary type (dedifferentiated), intraosseous; and (3) secondary type (dedifferentiated), peripheral.

Metastasizing ameloblastoma was kept under odontogenic/ameloblastic carcinoma.[21,25]

The WHO in 2017 (New Tumor Entities in the 4th Edition of the WHO Classification of Head and Neck Tumors: Odontogenic and Maxillofacial Bone Tumours, 2017) came out with a major change in ameloblastoma group:

- The update of ameloblastoma type was based on genetic studies.
- Ameloblastoma classification has been narrowed to ameloblastoma, unicystic, extraosseous/peripheral types.
- The solid/multicystic type was eliminated because most of the conventional ameloblastomas showed cystic degeneration with no biological differences.
- The desmoplastic type was left under the histopathological subtype (follicular, plexiform, acanthomatous, granular cell, basaloid, and desmoplastic) rather than as a separate entity.
- Ameloblastic carcinoma has now been classified under ameloblastic carcinomas based on the morphologic continuum and similar behavior between these entities.
- Metastasizing ameloblastoma is now moved to benign ameloblastoma subtypes from malignant odontogenic tumors (the main reason behind the change is attributed to the fact that primary and metastatic ameloblastomas are histopathologically identical to benign ameloblastoma).
- Odontoameloblastoma, which was used in the 2005 WHO classification, is no longer used because the ameloblastic areas in the odontoma do not justify a separate entity.[26]

Conclusion

Different researchers have worked over the years to stabilize the nomenclature of ameloblastoma based on the clinical behavior, the histological picture, and very recently through biological behavior, which states that this tumor holds an interesting position among the odontogenic tumors and has been a subject of interest among oral pathologist and molecular biologists. Science never claims to have the full, exact answer but only the best available answer that fits known conditions. As such, science is a continuous progression of study because experiments must often be repeated as new conditions are found, and the answers are refined to better fit the real world. Commemorating the commendable work done by the pioneers on this area, it will be a guided light to those who are willing to take up the torch of enlightenment for the betterment of the humankind.

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Conflicts of interest

There are no conflicts of interest.

References

1. Dumbravă MD, Rothschild BM, Weishampel DB, Csiki-Sava Z, Andrei RA, Acheson KA, *et al*. A dinosaurian facial deformity and the first occurrence of ameloblastoma in the fossil record. Nature 2016;6:1-7.
2. University of Washington. Fossilized evidence of a tumor in a 255-million-year-old mammal forerunner. ScienceDaily. December 8, 2016. Available from: https://www.sciencedaily.com/releases/2016/12/161208121323.htm. [Last accessed on 2019 March 14].
3. Schultz M. Malformations of odontogenic tissue in prehistoric human bone material. A contribution to the differential diagnosis of odontomas. Dtsch Zahnarztl Z 1978;33:715-24.
4. Baden E. Terminology of the ameloblastoma: History and current usage. J Oral Surg 1965;23:40-9.
5. Chute CG. Clinical classification and terminology: Some history and current observations. J Am Med Inform Assoc 2000;7:298-303.
6. Scultet I. L'Arcenal de Chirurgie. Lyon, France: Antoine Cellier; 1671.
7. Reichart PA, Philipsen HP. Odontogenic tumours and allied lesions. 1st ed. Philadelphia: Quintessence Publisher; 2004.
8. Elza S, Jananee J, Ravi L. A historical review of ameloblastoma. IJSR 2016;5:156-8.

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9. Dupuytren G. Des Kystes qui se developpent dans l'epaisseur des os et de leurs differentes especes. In: lecons orales. Vol. 4. Paris: J.B. Bailliere; 1832. p. 1-26.
10. Forget, AM. Etude histologique d'une tumeur fibreuse non decrite dans la machoire inferieure. Bul Soc Chir 1859;10:53.
11. Wedl C. Pathologie der Zaehne mit besonderer Rucksicht auf Anatomie und Physiologie. Leipzig: A. Felix; 1870. p. 274-5.
12. Neumann E. Ein Fall von unterkiefergeschwulst bedingt durch Degeneration eines Zahnsackes. Langenbecks Arch f Chir 1867;9:221.
13. Bennecke E. Beitrag zur Kenntnis der centralen epithelialen Kiefergeschwulste. Dtsch Zeitschr f Chir 1896;42:424.
14. Heath C. Five cases of tumor of jaws treated by excision. Brit M J 1887;1:777-9.
15. Falkson R. Zur Kenntnis der Kieferzysten. Virchows Arch 1879;76:504.
16. Malassez L. Sur la Pathogenie des kystes dentaites dites periostiques. J conn Med Prat 1884;7:98.
17. Derujinsky. Ueber einen epithelialen Tumour im Unterkiefer (Epihtelioma adamantinum). Wien kin Wchschr 1895;3:775.
18. Masthan KM, Anitha N, Krupaa J, Manikkam S. Ameloblastoma. J Pharm Bioallied Sci 2015;7:S167-70.
19. Ragunathan YT, Madhavan NR, Mohan SP, Kumar SK. Immunohistochemical detection of p75 neurotrophin receptor (p75-NTR) in follicular and plexiform ameloblastoma. J Clin Diagn Res 2016;10:1-4.
20. Soukup WJ, Bell CM. Nomenclature and classification of odontogenic tumors—Part 1: Historical review. J Vet Dent 2014;31: 228-32.
21. Barnes L, Eveson JW, Reichart P, Sidransky D, editors. World Health Organization classification of tumours. Pathology and genetics of head and neck tumours. Lyon, France: IARC Press;2005.
22. Palmer A. Histological typing of odontogenic tumours, jaw cysts and allied lesions. Pathology 1973;5:261-2.
23. Reichart PA, Ries P. Considerations on the classification of odontogenic tumours. Int J Oral Surg 1983;12:323-33.
24. Kramer IRH, Pindborg JJ, Shear M. Histological classification of odontogenic tumours. In: Histological typing of odontogenic tumours. Heidelberg: Springer-Verlag; 1992. p. 7-9.
25. Philipsen HP, Reichart PA. Classification of odontogenic tumours. A historical review. J Oral Pathol Med 2006;35:525-9.
26. Speight P, Takata T. New tumour entities in the 4th edition of the World Health Organization Classification of Head and Neck tumours: Odontogenic and maxillofacial bone tumours. Virchows Archiv 2017;472:331-9.