

## Classification of Odontogenic Tumors: A Review Update

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### Abstract

The Odontogenic tumors have a wide range of disorders of growth, either malignant or benign form of neoplasm, to malformations of dental tissues of growth. The last WHO classification of odontogenic tumors was 8 years ago and it is time for revision with some current changes and addition. This review enlightens on various classifications of odontogenic tumors and focusing on its nomenclature systems and pathogenesis.

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### Introduction

Odontogenic tumors (OT) comprise a group of lesions of the jaw, derived from primordial tooth forming tissues and presenting in a large number of histological patterns. Some of these lesions, particularly the odontomas, are now interpreted as developmental malformations or hamartomatous lesions rather than true neoplasms. Other lesions, such as ameloblastomas, are accepted as true neoplasms and must be diagnosed and treated as such. Odontogenic tumors share two major characteristics, namely they arise from the tissue with the potential for differentiation into tooth or periodontal structures and are therefore found exclusively in the mandible and the maxilla and, on rare occasions, the gingiva. Another variable but distinctive feature includes formation of tooth related extracellular substances some of which may calcify and be visible on radiographs; they are a product of epithelial-mesenchymal interactions.<sup>1-4</sup>

The most common sites of these tumors are the mandibular molar region and the maxillary cuspid region. These tumors are usually slow growing and asymptomatic. Certain

Odontogenic tumors have a predilection for particular ages, gender, geographic location, and race.<sup>5</sup>

In brief they are the lesions of the mandible and the maxilla and on rare occasions, of the gingiva which should be considered as a differential diagnosis when analyzing jaw lesions. Odontogenic tumors constitute a group of heterogeneous lesions that range from hamartomatous or non-neoplastic tissue proliferations to malignant neoplasms with metastatic capabilities.<sup>6,7</sup>

### Classification of Odontogenic Tumors

In 1914 British Dental Association: 8,9

1. Included Both Radicular and Dentigerous Cysts as Odontomes.
2. They Grouped Lesions Into Three Categories:
  - a. Epithelial Origin
  - b. Composite
  - c. Connective Tissue Origin

In 1946 Thoma And Goldman Classified Odontogenic Tumors Into: 10

1. Ectodermal Origin
2. Mesodermal Origin
3. Mixed Origin

(This classification was widely accepted and formed in 1950. The present classification was approved by American Academy of Oral Pathology).

In 1958, Pindborg and Clausen Classified 11

1. Epithelial Odontogenic Tumors On, Whether

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2. Inductive Changes in Connective Tissue
3. No Inductive Changes in Connective Tissue

In 1961, Robert J et al gave Odontogenic Tumors Classification, Histopathology and Clinical Behavior in Man and Domesticated Animal.<sup>12</sup>

#### I Epithelial Odontogenic Tumors

- A. No Inductive Change in Connective Tissue
  1. Ameloblastoma
  2. Ameloblastic Adenomatoid Tumor (Adenoamelo- Blastoma)
  3. Calcifying Epithelial Odontogenic Tumor
- B. Inductive Change in Connective Tissue
  1. Ameloblastic Fibroma & Ameloblastic Sarcoma
  2. Dentinoma
    - a). Immature (Fibroameloblastic Type)
    - b). Mature
  3. Ameloblastic Odontoma & Ameloblastic Odonto- Sarcoma
  4. Complex Odontoma
  5. Compound Odontoma
- II. Mesodermal Odontogenic Tumors
  - A. Odontogenic Myxoma & Fibroma
  - B. Cementifying Fibroma (Periapical Fibrous Dysplasia)
  - C. Periapical Fibrous Dysplasia Type
  - D. Gigantiform Type

In 1887 Blandsutton Subdivided Odontomes Into:<sup>13</sup>

1. Arising From Aberration of Enamel Organ.
2. Arising From Aberration of Dental Follicle.
3. Arising From Aberration of Dental Papilla.
4. Arising From Aberration of Whole Tooth Germ.
5. Anomalous Odontomes.

In 1992, edition of WHO series "Histological Typing of Odontogenic Tumors" was modified In 2002, WHO gave "Histological Typing of Odontogenic Tumors, Jaw cysts and Allied lesions".<sup>14,15,16</sup>

#### I. Benign Tumors

- A. Odontogenic Epithelium Without Odontogenic Ectomesenchyme
  1. Ameloblastoma
  2. Squamous Odontogenic Tumor
  3. Calcifying Epithelial Odontogenic Tumor
  4. Adenomatoid Odontogenic Tumor
- B. Odontogenic Epithelium With Odontogenic Ectomesenchyme With Or Without Hard Tissue

#### Formation

1. Ameloblastic Fibroma
2. Ameloblastic Fibrodentinoma
3. Ameloblastic Fibro-Odontoma
4. Odontoameloblastoma
5. Calcifying Odontogenic Cyst
6. Complex Odontoma
7. Compound Odontoma

#### C. Odontogenic Ectomesenchyme With or Without Inclusion of Odontogenic Epithelium

1. Odontogenic Fibroma.
2. Odontogenic Myxoma.
3. Cementoblastoma.

#### II. Malignant Tumors

- A. Odontogenic Carcinoma.
  1. Malignant Ameloblastoma.
  2. Primary Intraosseous Carcinoma.
  3. Clear Cell Odontogenic Carcinoma.
  4. Ghost Cell Odontogenic Carcinoma.
- B. Odontogenic Sarcomas.
  1. Ameloblastic Fibrosarcoma.
  2. Ameloblastic Fibrodentinoma.
  3. Ameloblastic Fibro-Odontosarcoma.

The revised classification of 1992 edition of WHO blue book on head & neck tumours on odontogenic tumour chapter By Reichert And Philipsen.<sup>17,18,19</sup>

#### I. Benign Tumors

- A. Odontogenic Epithelium With Mature, Fibrous Stroma; Without Odontogenic Ectomesenchyme
  1. Ameloblastoma
  2. Solid/Multicystic Ameloblastoma
  3. Extraosseous / Peripheral Ameloblastoma
  4. Desmoplastic Ameloblastoma
  5. Unicystic Ameloblastoma
  6. Squamous Odontogenic Tumor
  7. Calcifying Epithelial Odontogenic Tumor
  8. Adenomatoid Odontogenic Tumor
  9. Keratinizing Cystic Odontogenic Tumor
- B. Odontogenic Epithelium with Odontogenic Ectomesenchyme With or Without Dental Hard Tissue Formation
  1. Ameloblastic Fibroma
  2. Ameloblastic Fibrodentinoma
  3. Ameloblastic Fibro-Odontoma
  4. Complex Odontoma
  5. Compound Odontoma
  6. Odontoameloblastoma

7. Calcifying Cystic Odontogenic Tumor
8. Dentinogenic Ghost Cell Tumor

C. Mesenchyme And / Or Odontogenic Ectomesenchyme With or Without Odontogenic Epithelium

1. Odontogenic Fibroma
2. Epithelium Rich Type
3. Epithelium Poor Type
4. Odontogenic Myxoma Or Fibromyxoma
5. Cementoblastoma

II. Malignant Tumors

A. Odontogenic Carcinoma

1. Metastasizing, Malignant Ameloblastoma
  2. Ameloblastic Carcinoma
  3. Primary
    - a. Secondary (Dedifferentiated) Intraosseous
    - b. Secondary (Dedifferentiated) Extraosseous
  4. Primary Intraosseous Squamous Cell Carcinoma (PIO SCC)
  - a. PIO SCC Solid Type
  - b. PIO SCC Derived From Odontogenic Cyst
  - c. PIO SCC Derived From Keratinizing Cystic Odontogenic Tumor
5. Ghost Cell Odontogenic Carcinoma

B. Odontogenic Sarcomas

1. Ameloblastic Fibrosarcoma
2. Ameloblastic Fibrodentinosa sarcoma
3. Ameloblastic Fibroodontosarcoma

2005, WHO classification (proposed in 2003 published in, Leon in July 2005) 20,21 Malignant Tumors.

A. Odontogenic Carcinoma

1. Metastasizing Ameloblastoma
2. Ameloblastic Carcinoma
  - a. Primary
  - b. Secondary
    - Secondary (Dedifferentiated) Intraosseous
    - Secondary (Dedifferentiated) Extraosseous
  - Primary Intraosseous Squamous Cell Carcinoma (Pioscc)
  - a. Pioscc Solid Type
  - b. Pioscc Derived from Odontogenic Cyst
  - c. Pioscc Derived from Keratinizing Cystic Odontogenic Tumor
    4. Clear Cell Odontogenic Carcinoma
    5. Ghost Cell Odontogenic Carcinoma

B. Odontogenic Sarcomas

1. Ameloblastic Fibrosarcoma
2. Ameloblastic Fibrodentinosa sarcoma

3. Ameloblastic Fibroodontosarcoma

II. Benign Tumors

A. Odontogenic Epithelium With Mature, Fibrous Stroma; Without Odontogenic Ectomesenchyme

1. Ameloblastoms
2. Solid/Multicystic Ameloblastoma
3. Extraosseous / Peripheral Ameloblastoma
4. Desmoplastic Ameloblastoma
5. Unicystic Ameloblastoma
6. Squamous Odontogenic Tumor
7. Calcifying Epithelial Odontogenic Tumor
8. Adenomatoid Odontogenic Tumor
9. Keratinizing Cystic Odontogenic Tumor

B. Odontogenic Epithelium with Odontogenic Ectomesenchyme with or Without Dental Hard Tissue Formation

1. Ameloblastic Fibroma
2. Ameloblastic Fibrodentinoma
3. Ameloblastic Fibro-Odontoma
4. Complex Odontoma
5. Compound Odontoma
6. Odontoameloblastoma
7. Calcifying Cystic Odontogenic Tumor
8. Dentinogenic Ghost Cell Tumor

C. Mesenchyme and / Or Odontogenic Ectomesenchyme With or Without Odontogenic Epithelium

1. Odontogenic Fibroma
2. Epithelium Rich Type
3. Epithelium Poor Type
4. Odontogenic Myxoma Or Fibromyxoma
5. Cementoblastoma

In 2005, Who Histological Classification of Odontogenic Tumours.22,23,24,25,26,27

I. Malignant Tumours

A. Odontogenic Carcinomas

1. Malignant Ameloblastoma
2. Ameloblastic Carcinoma - Primary Type
3. Ameloblastic Carcinoma - Secondary Type (Dedifferentiated), Intraosseous
4. Ameloblastic Carcinoma - Secondary Type (Dedifferentiated), Peripheral
5. Primary Intraosseous Squamous Cell Carcinoma - Solid Type
6. Primary Intraosseous Squamous Cell Carcinoma Derived From Keratocystic Odontogenic Tumour
7. Primary Intraosseous Squamous Cell Carcinoma Derived From Odontogenic Cyst

8. Clear Cell Odontogenic Carcinoma
9. Ghost Cell Odontogenic Carcinoma
- B. Odontogenic Sarcomas
  1. Ameloblastic Fibrosarcoma (Ameloblastic Sarcoma)
  2. Ameloblastic Fibrodentinosa And Fibro-Odontosarcoma

## II. Benign

- A. Odontogenic Epithelium Mature, Fibrous Stroma without Odontogenic Ectomesenchyme
  1. Ameloblastoma, Solid/Multicystic Type
  2. Ameloblastoma, Extraosseous/Peripheral Type
  3. Ameloblastoma, Desmoplastic Type
  4. Ameloblastoma, Unicystic Type
  5. Squamous Odontogenic Tumour
  6. Calcifying Epithelial Odontogenic Tumour (Pindborg Tumour)
  7. Adenomatoid Odontogenic Tumour
  8. Keratocystic Odontogenic Tumour

## B. Odontogenic Epithelium with Odontogenic Ectomesenchyme, With Or Without Hard Tissue Formation

1. Ameloblastic Fibroma
2. Ameloblastic Fibrodentinoma (Dentinoma)
3. Ameloblastic Fibro-Odontoma
4. Odontoma
  - a. Odontoma, Complex Type
  - b. Odontoma, Compound Type
5. Odontoameloblastoma
6. Calcifying Cystic Odontogenic Cyst
7. Dentinogenic Ghost Cell Tumour
- C. Mesenchyme And/Or Odontogenic Ectomesenchyme With or Without Odontogenic Epithelium
  1. Odontogenic Fibroma
  2. Odontogenic Myxoma / Myxofibroma
  3. Cementoblastoma
  4. Bone-Related Lesions
  5. Ossifying Fibromas (A.K.A. Cemento-Ossifying Fibroma)
  6. Fibrous Dysplasia
  7. Osseous Dysplasias
  8. Central Giant Cell Lesion (Granuloma)
  9. Cherubism
  10. Aneurysmal Bone Cyst
  11. Simple Bone Cyst
  12. Other Tumours
    - a. Melanotic Neuroectodermal Tumour Of Infancy

## Conclusions

The classification and terminologies used to describe the odontogenic tumors have undergone various modifications since 1887. The various changes were introduced till date. In the recent years the additional knowledge has accumulated that result in refining the classification of both benign and malignant tumors. The changes in the classification make it simple and help us to understand not only the pathogenesis of the tumor but also to determine the behavior and prognosis of the tumor. The purpose of the article is to make the classification should be simple, reproducible, have clinical utility, and be easy for non-specialist pathologists to understand and use.

## Declaration of Interest

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