

# **DENTO-MAXILLARY RADIOLOGY AND IMAGING**

## **Course 12**

### **RADIODIAGNOSTIC OF DENTAL ABNORMALITIES**

#### **12.1. ALTERATIONS IN SHAPE**

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#### **12.5. ABNORMALITIES OF DENTAL PULP**

Dental abnormalities are caused by dental embryogenesis alterations, due to different factors which act in the different phases of dental organogenesis.

Every malformation has a specific etiopathogeny which can be detected in a particular moment of ontogenesis.

### **DENTAL ABNORMALITIES - TYPES**

There were described and classified upon type of alteration as:

- **ALTERATIONS IN SHAPE**
- **ALTERATIONS IN NUMBER**
- **ALTERATIONS IN SIZE**
- **DEFECTS OF STRUCTURE**
- **ABNORMALITIES OF DENTAL PULP**

#### **12.1. ALTERATIONS IN SHAPE**

There were described many shape alterations of dental segments:

- **GEMINATION**
- **DENTAL FUSION**
- **CONCRESCENCE**
- **DILACERATION**
- **DENS INVAGINATUS**
- **DENS EVAGINATUS**
- **TAURODONTISM**
- **ENAMEL PEARLS**
- **SUPERNUMERARY ROOTS**

- **ATRITION**
- **ABRASION**
- **EROSION**

## **GEMINATION**

It is characterized by the appearance of two crowns that share the same root canal as an attempt to make two teeth from a single enamel organ resulting partial cleavage or complete cleavage or twinning with two teeth from one tooth germ.

## **DENTAL FUSION**

May be partial (involve the roots only) or complete (involve the entire length of the teeth).

Complete dental fusion, usually affects the incisor region and is characterized by:

- the joining of two developing tooth germs resulting in a single large tooth structure,
- with only one pulp chamber and separated or shared root canals.

## **CONCRESCENCE**

It's a partial form of fusion in which the adjacent already - formed teeth are joint by cementum.

May take place before or after eruption of teeth, most commonly seen in association with the maxillary second and third molars.

No significance unless one of the teeth involved requires extraction, when surgical sectioning may be required to save the other tooth.

## **DILACERATION**

Characterized by an extraordinary curving or angulation of tooth roots may be related to trauma, infections or regional pressings during root development.

Extraction when is needed may be difficult and root canals filling are challenging.

## **DENS INVAGINATUS**

Or amelo-dentin invagination is an uncommon tooth anomaly representing an exaggeration or accentuation of the lingual pit, resulting a “finger glove”- like enamel in dentin invagination at a tooth level.

The permanent maxillary lateral incisors are most commonly involved.

It is radiographically detected as the appearance of a dismorphic tooth within a tooth or dens in dente, as a “candle flame” in the central incisor part.

## **DENS EVAGINATUS**

It is a relatively common developmental condition affecting predominantly premolar teeth, reported almost exclusively in individuals of the Mongoloid race (Asians, Eskimos and Native Americans).

The defect is an anomalous tubercle or cusp located in the center of the occlusal surface.

Due to occlusal abrasion, the tubercle wears relatively quickly, causing early exposure of the accessory pulp horn that extend into the tubercle and this may result in periapical pathology in young people.

## **TAURODONTISM**

The term is coined because in this abnormality the teeth resemble the teeth in bulls and other ungulates.

The involved teeth are the molars, which have elongated crowns or apically displaced furcation, resulting pulp chambers with increased apical-occlusal height.

The presence of the Carabelli tubercle - a supernumerary tubercle on the palatal face of the first superior molar and of the Bolk tubercle - a supernumerary tubercle on the lingual face of the molars has no radiological importance.

## **ENAMEL PEARLS**

Or ameloma, is a circumscribed amelar evagination on a premolar cusp or between the roots of the molars, especially maxillary - in the bifurcation or trifurcation. They are droplets of ectopic enamel, occasionally supported by dentin and rarely have a pulp horn.

They are radiographically detected as radioopacities. When they are located in the area of the periodontal disease, may contribute to the extension of a periodontal pocket.

## **SUPERNUMERARY ROOTS**

Accessory roots are most commonly seen in mandibular canines, premolars and molars (especially third molars) and only rarely found in upper anterior teeth and mandibular incisors.

They are radiographically detected as an extraordinary number of roots, fact that becomes important when extraction or root canal fillings are necessary.

## **ATRITION**

It is physiologic wearing of teeth resulting from mastication, being an age-related process and varies from one individual to another.

Significantly influences have the pattern and extent of factors such as: diet quality, dentition, jaw musculature and chewing habits.

It may induce reactive secondary dentin apparition who may lead to the pulp chamber and root canals extinction.

## **ABRASION**

It is the pathologic wearing of teeth resulting from an abnormal habit or abnormal orally use of abrasive substances:

- pipe smokers,
- tobacco chewing,
- aggressive tooth brushing,
- use of abrasive dentifrices.

The location and pattern is directly dependent upon the cause with the so called toothbrush abrasion along the cemento - enamel junction.

## **EROSION**

It is the loss of tooth structure from a non-bacterial chemical process, usually the lingual surfaces of maxillary teeth or even all surfaces being affected.

The most commonly acids are involved in the dissolution process, either from an external or an internal source:

- external: work environment (battery manufacturing) or in diets (excessive use of citrus fruits),
- internal: regurgitation of gastric contents, chronic vomiting, self-induced vomiting as a component of anorexia nervosa or bulimia.

## **12.2. ALTERATIONS IN NUMBER**

There were described as number alterations of dental segments:

- **ANODONTIA**
- **SUPERNUMERARY TEETH**

## **ANODONTIA**

May be:

**COMPLETE** anodontia - all teeth missing, rare and often associated with an X - linked recessive disorder - hereditary ectodermal dysplasia.

**PARTIAL** anodontia (oligodontia or hipodontia) is relatively common and the usually missing teeth are: third molars, second premolars, and maxillary lateral incisors.

**PSEUDO**anodontia - the teeth are clinically absent because of impaction or delayed eruption - impaction - most frequently affects the mandibular third molars and maxillary cuspids.

**FALSE** anodontia - the teeth have been exfoliated or extracted.

## **SUPERNUMERARY TEETH**

Polydontia or hyperdontia most probably result from continue proliferation of the permanent or primary dental lamina to form a third tooth germ.

May have a normal morphology or may be rudimentary and miniature.

The most are isolated events, although some may be familial and others may be syndrome associated (Gardner's syndrome, cleido - cranial dysplasia)

They are found more often in the permanent than in the primary dentition, much more frequently seen in the maxilla than in the mandible.

The anterior midline of the maxilla is the most common site, in which case are known as mesiodens, the maxillary molar area (fourth molar or paramolar) being the second most common site.

Supernumerary teeth appearing at the time of birth are known as natal teeth - a rare event. Supernumerary teeth appearing after the loss of the permanent teeth is known as post permanent dentition - also a rare event.

### **12.3. ALTERATIONS IN SIZE**

There are described dental size alterations as:

- **MACRODONTIA**
- **MICRODONTIA**

## **MACRODONTIA**

Or dental gigantism, may be generalized as enlarged teeth throughout the dentition as in pituitary gigantism or may be localized to an abnormally large tooth or group of teeth, more frequently seen in superior central incisors.

## **MICRODONTIA**

Or dental nanism, may also be generalized as smaller teeth than normal throughout the dentition as in pituitary dwarfism, or may be localized to a single tooth smaller than normal, more frequently seen with maxillary lateral incisors in which the tooth crown appears cone - or peg - shaped prompting the designation peg lateral.

The second most commonly seen microdont is the maxillary third molar followed by supernumerary teeth.

## **12.4. DEFECTS OF STRUCTURE**

Depending on the specific layer of the dental structure affected there may be found:

- DEFECTS OF ENAMEL
- DEFECTS OF DENTIN
- DEFECTS OF ENAMEL AND DENTIN

### **12.4.1. DEFECTS OF ENAMEL**

May be:

- QUANTITATIVE with normal hardness - HYPOPLASIA,
- QUALITATIVE with normal amounts but hypomineralized, being softer than normal - HYPOCALCIFICATION.

May occur environmental or in hereditary disorders.

### **ENVIRONMENTAL ENAMEL DEFECTS**

(with the extent of damage depending on duration, timing and intensity or concentration of the causative agents), being due to:

- local causes: trauma or abscess
- systemic factors:
  - childhood infectious diseases,
  - nutritional defects (rickets),
  - congenital syphilis (Hutchinson's incisors - tapered incisally

and notched centrally on the incisal edge, also mulberry molars with lobulated or crenelated occlusal surface),

- drinking fluoride containing water (at levels greater than 1 part per million during the time the crowns are being formed may result in fluorosis) and

- Idiopathic.

**ENAMEL DEFECTS MAY OCCUR IN HEREDITARY DISORDERS as:**

#### **AMELOGENESIS IMPERFECTA**

Group of similar-appearing enamel defects in both dentition, with different inheritance patterns and clinical manifestation divided in 3 major types, each one with also numerous recognized subtypes:

- TYPE I - HYPOPLASTIC - teeth erupt with insufficient amounts of enamel ranging from pits and grooves to complete absence - due to reduced enamel thickness, in some cases, abnormal contour and absent interproximal contact points may be evident

- TYPE II - HYPOCALCIFIED - the quantity of enamel is normal but it is soft and friable, so that it fractures and wears readily.

- TYPE III - HYPOMATURATED - has been recently added.

Radiographically enamel appears reduced in bulk, often showing a thin layer over the occlusal and interproximal surfaces, dentin and pulp chambers appearing normal,

Although the enamel is soft and irregular, teeth are not caries prone, no treatment being necessary, restoration only for cosmetic reasons.

#### **12.4.2. DEFECTS OF DENTIN**

##### **DENTINOGENESIS IMPERFECTA**

It is an autosomal dominant trait with variable expressivity, which affects dentin of both dentitions, being divided into 3 types:

- TYPE I - dentin abnormality occurs in patients with concurrent osteogenesis imperfecta,

- TYPE II - patients have only dentin abnormalities and no bone disease,

- TYPE III - only dentin abnormalities with periapical radiolucencies and variable radiographic appearance.

Clinically all three types share numerous features, teeth exhibiting an unusual translucent, opalescent appearance with color variation from yellow-brown to gray, being also known as hereditary opalescent dentin.

Radiographically type I and type II exhibit identical changes:

- opacification of dental pulps occurs owing to continue deposition of abnormal dentin,
- the short roots and the bell shaped crowns are also obvious on radiographic examination,
- type III - the dentin appears thin and the pulp chambers and root canals are extremely large, giving the appearance of the dentin shells, hence the previous designation of shell teeth.

## **DENTIN DYSPLASIA**

Another autosomal dominant trait that affects dentin, a rare one that has been subdivided into:

- TYPE I - RADICULAR type, with both dentitions of normal color, extremely short roots and almost completely obliterated pulps.

Residual fragments of pulp tissue appear typically as horizontal radiolucencies (chevrons).

Radiographically periapical radiolucencies are typically seen and represent: chronic abscesses, granulomas or cysts.

- TYPE II – CORONAL type, with the primary dentition opalescent and the permanent dentition of normal color, radiologically deciduous teeth are similar to type I, but permanent teeth exhibit enlarged pulp chambers described as "thistle tube" in appearance.

## **12.4.3. DEFECTS OF ENAMEL AND DENTIN**

### **Regional ODONTODYSPLASIA**

Involves the hard tissue derived from both the epithelial (enamel) and mesenchymal (dentin and cementum).

The permanent teeth are affected more than the primary teeth and the maxillary anterior teeth are affected more than other teeth.

Eruption of the affected teeth is delayed or does not occur and the affected teeth exhibit short roots, open apical foramina and enlarged pulp chambers.

Due to the thinness and poor mineralization of the enamel and dentin the affected teeth have the appearance of "ghost teeth".

Because of the poor quality, the removal is usually indicated and the resulting edentulous zone can be restored with prosthesis.

## **12.5. ABNORMALITIES OF DENTAL PULP**

Dental pulp abnormalities may be detected as:



- PULP CALCIFICATION
- INTERNAL RESORPTION
- EXTERNAL RESORPTION

## **PULP CALCIFICATIONS**

It is a rather common phenomenon that occurs with increasing age for no apparent reason.

There appears to be no relation to inflammation, trauma or systemic disease.

They may be microscopic in size or it may be large enough to be detected radiographically, being described:

- diffuse or linear deposits, typically found in the root canals and generally are parallel to the blood vessels,
- nodular or pulp stones are usually found in pulp chamber and may be composed predominantly of dentin being referred as denticles or represent foci of dystrophic calcification being referred as false denticles.

Nodular or pulp stones may be subdivided into attached and free types, depending on whether they are incorporated into the dentin wall or are surrounded by pulpal tissue, appearing to have no clinical significance, they are not believed to be a source of pain and are not associated with any forms of pulpitis, but they may be problematic during endodontic therapy of non-vital teeth.

## **INTERNAL RESORPTION**

Appearing as a resorption of the dentin of the pulpal walls may be of inflammatory cause or idiopathic (no apparent trigger can be identified).

Any tooth can be involved, usually one single tooth and until root fracture or communication to a periodontal pocket patient have no symptoms,

Occasionally may spontaneously arrest or may be treated before perforation by root canal therapy.

## **EXTERNAL RESORPTION**

Appearing as a dental resorption from external surfaces, may be the result of an adjacent pathologic process such as: chronic inflammatory lesions, cysts, benign tumors, malignant neoplasm that release chemical mediators, increase vascularity and pressure.

It may also be seen in association with injury to the periodontal ligament by: trauma, impactions, replantation or transplantation of teeth and idiopathic.

