

DENTO-MAXILLARY RADIOLOGY AND IMAGING

Course 13

DENTAL CARIES CLINIC RADIODIAGNOSTIC

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Defined as a focal substance loss from a temporary or permanent dental segment, dental caries may be considered from the natural or under therapy evolving points of view as:

- **SIMPLE CARIES**
- **TREATED CARIES**
- **TREATED AND RECURRENT CARIES**
- **SECONDARY CARIES**
- **COMPLICATED CARIES**

13.1. SIMPLE CARIES

It is the principle endodontic lesion, of certainly infectious etiology, with micro traumas favoring causality at the cusp level and complex determinant role of bacteria plaque in smooth facet segment.

Although clinic easily detectable, the X-ray exam is the first intention paraclinical investigation with decisive impact on: diagnostic, lesional extension appreciation and therapeutic quality evaluation.

After the topography of destructive process localization crown caries may be classified as:

- caries of the cusp occlusal surfaces,
- caries of the smooth vestibular, oral and interproximal surfaces.

The two lesional categories grouping: concomitant etiopathogenic and morphopathological differentiations, with a distinct clinico-radiological aspect, determined by specific architecture of enamel protective layers.

In cases of the smooth vestibular, oral and interproximal surfaces caries it must be made delimitation upon the lesion position to the cervical line with identification of:

- enamel caries in occlusal sense and
- cement caries in radicular sense.

13.1.1. RADIOGRAPHIC ASPECT

The specific loss of calcified dental segment radiopaque substance may be detected as a focal radiolucency usually pathognomonic for carious lesion diagnosis,

For this purpose it is sufficient a correct retroalveolar, isometric and ortoradial radiography, very useful in crown and root carious lesion localization.

For diagnosis of interdental caries localized at the level of interproximal surfaces are indicated interproximal "Bitewing" radiographies,

For diagnosis of vestibular and oral surfaces caries are indicated intraoral radiographies in occlusal axial projection techniques.

13.1.2. STAGING

Crown caries have a specific radiographic aspect depending of different topographic localization, with subtle lesional variation upon natural evolution, being detected in one of the four stages:

- Stage I: Initially appear a minimum superficial loss at the level of regional enamel, usually radiographically invisible.
- Stage II: Next, all layers of enamel are destroyed and the carious lesion reaches the junction with dentin, being detected as a narrow radiolucency which passes through all enamel layers.
- Stage III: After all layers of enamel are destroyed the lesion progress and exceed the junction with dentin, with concomitant dentin imply and a larger radiolucency detection, which passes through all enamel layers and dentin, approaching to the chamber pulp.
- Stage IV: The lesional carious process destroy all the enamel and dentin, with open and exposure of pulp chamber, the radiolucency passing through all layers of enamel and dentin and reaches the pulp chamber.

While going through the lesional stages allows us to identify three evolutive types of dental caries:

- acute,
- chronic,
- stationary.

ACUTE CARIES

With rapid evolution, characterized by intense and rapidly destruction of dentin, are specific to young people who, by rich in carbohydrate diet, under conditions of immature structure of enamel and with a poor oral hygiene, favor the destructive process with the involvement in a few month of several regional dental segments.

CHRONIC CARIES

With slow evolution, characterized by slowly destruction process with superficial lesional progression, are specific to mature people who have a mature structure of enamel, with a careful oral hygiene and a diet usually poor in mono-, di- or polysaccharides.

STATIONARY CARIES

With interrupted evolution, detected in adults on free dental surfaces, usually in cervical regions of inferior premolars, destroying radicular cement exposed by gingival regression, but with a relative effective autohygiene.

CEMENTAL CARIES

Appear in marginal periodontopathies in which due to the existence of periodontal pockets there is an initial denudation of the cementum follow by its secondary destruction, radiographically diagnostic assessed by detection at the regional radicular level, of a crescent marginal radiolucency usually superficial.

13.1.3. SIMPLE CARIES - CLASSIFICATION

There are described several anatomo - clinical forms of dental caries, everyone with a distinct typical radiographical aspect.

Topographically dental caries were classified in:

- CROWN CARIES
- CERVICAL CARIES
- RADICULAR CARIES
- ON INCLUDED TEETH CARIES

CROWN CARIES

Also classify after topo - anatomic lesional involvement in:

1. CUSPID OCCLUSAL SURFACES CARIES
2. SMOOTH VESTIBULAR AND ORAL SURFACES CARIES
3. APPROXIMAL CARIES

1. CUSPID OCCLUSAL SURFACES CARIES

Have a triangular shape with the top to enamel and the base to dentin, due to divergent orientation of enamel protective prisms.

A minimum carious lesion, usually caused at the level of a loco-regional fissure will deeply develop by greater diametrical destructions due to this fact.

They are rarely radiographically detected, due to intense radioopacity of enamel layer, especially at the cusp level which can mask the lesions.

2. SMOOTH VESTIBULAR AND ORAL SURFACES CARIES

Have a triangular shape with the base to dental surface and the top to dentin, due to convergent orientation of enamel prisms which limit in depth lesional progression.

They are rarely radiographically detected, due to perpendicular projection on incident X-ray beam.

3. APPROXIMAL CARIES

They are localized on aproximal facet of the dental segments, being the most easily radiographically detected, due to tangential projection of incident X - ray beam, even in superficial forms with the lesion affecting only the enamel layer.

Depending on localization to the contact point there are distinguished the following forms:

- caries localized above the contact point, clinic easily detectable;
- caries localized at the level of the contact point, clinic harder detectable especially in initial faze, requiring X-ray exam for diagnostic assessment;
- caries localized under the contact point, radiographically firstly detectable.

CERVICAL CARIES

Appear as round-ovalary shape superficial substance loss with great superficial opening, localized at gingival level, usually covert by tartar, or beneath a prosthetic device.

Are always radiographic detected as a round-ovalary radiolucency with opening to the dental surface.

RADICULAR CARIES

Appear always in the presence of marginal periodontal pockets which denude the cementum allowing the destructive process to act, resulting extended superficial erosion, with irregular diffuse contour. At any faceto-segmentar localization, appear osteolysis of varying dimensions, usually only radiographically detectable.

CARIES ON INCLUDED TEETH

Rarely appearing by denudation of osseous wall of follicular bag caused by: a marginal periodontal pocket or after extraction of a dental neighborhood segment, only radiographically detectable.

13.2. TREATED CARIES

In which, carious lesion passes through a iatrogenic transformation by altered dental tissues removal and an endodontic cavity creation in order to obturation filling material incorporation.

The transformation of simple dental caries in cavities in order to therapeutic obturation, results in five topographic groups of cavities, determined by the initial position of carious lesion on crown dental surfaces, which after G.V. Black classification are:

CLASS I CAVITIES

Appear by transformation of caries localized on occlusal surfaces of: frontal teeth, premolars and molars.

CLASS II CAVITIES

Result after approximal surfaces caries treatment of molars and premolars.

CLASS III CAVITIES

Result after approximal surfaces caries treatment of frontal teeth with uncompromised incisor angle.

CLASS IV CAVITIES

Delimited by therapeutic transformation of approximal surfaces caries on incisors with destroyed incisor angle.

CLASS V CAVITIES

Identified after therapeutic transformation of caries localized in cervical or oral 1/3 of the teeth.

Due to great manifestation varieties of carious lesional process, appear clinico-morphologic situations which impose some atypical cavity preparation composed mostly by minimum two dental surfaces implication:

- vestibulo-occlusal cavities
- vestibulo-mesial cavities
- mesio-oral cavities
- disto-oral cavities.

In many cases of extensive carious lesions one may adopt special therapeutic solutions reaching to preparation of mesio-occluso-distal cavity.

Radiographic image

Depending on obturation material used, the iatrogenic filled resulting cavities will be radiographic detected as:

- Radioopacities: metal amalgam containing silver, copper or gold, phosphates - cement, etc.
- Radiolucencies: porcelain, silicates, polymers, etc.

TREATED AND RECURRENT CARIES. SECONDARY CARIES

Appear beneath and around of an older obturation due to incomplete removal of altered dentin, only radiographically detectable as an excessive radiolucent osteolysis, diffuse outlined, close to an obturated cavity.

13.3. COMPLICATED CARIES

Natural carious lesion evolution as a progressive destruction to pulp chamber, which once open result in a solution of continuity with the body's internal environment, making from dental caries morbid entities with various possibilities of aggravation and implication of different regional or distant organic structures, being always necessary a continuous investigation and an adequate therapy.

Depending of septic extension complications of the carious lesional process, Cavézian R., Pasquet G., Bel G. classify, in 1995, dental caries complications in:

- local complications;
- regional complications;
- distant complications.

13.3.1. LOCAL COMPLICATION

Are the result of extension of inflammatory process to local anatomic structures, immediately implied by nearby propagation in all pulp chambers and the development to apex, with the resulting specific morbid entities at the level of:

- periodontium,
- alveolar osseous structure
- adjacent soft tissues.

PULPITIS AND PULP NECROSIS

Define the natural extension of a secondary inflammation due to a deep carious lesion to all dental pulp with evolution to progressive necrosis.

Radiological there is no detectable modification in acute pulpitis. In chronic pulpitis there are radiologically detectable secondary dentin deposition as pulpolithes or denticles on pulp chamber and radicular canals walls.

APICAL PERIODONTITIS

Is the result of inflammatory modifications at the level of dental apex with acute or chronic evolution.

ACUTE APICAL PERIODONTITIS

Determine a periapical inflammatory reaction with tooth pain at simple touch and "long tooth" sensation, radiological appearing modifications only after 7 - 10 days of evolution as a periapical radiolucency with:

- alveolar texture disappearance,
- periapical lamina dura netity disappearance,
- periodontal space extension.

CHRONIC APICAL PERIODONTITIS

Is represented by periapical dental granulomas and periapical cyst, chronic resulted masses due to inflammatory process persistency.

Any clinico-morphologic form appear radiographic the same: a focal periapical radiolucency, process named as rarefying osteitis.

RADICULAR CHANGES

Inflammatory induced hypervascularisation may determine a resorbtion of the apex named *resalylsis*, produced by a chronic endodonto-apical inflammation, radiographic detected as the disappearance of apical 1/3 of interested root.

Hypercementosis appear also in chronic periapical inflammation, being a cementum proliferation at the radicular outline with the interested dental segment ankylosis.

Osteitis, osteomyelitis and vestibular abscess represent infectious-inflammatory exacerbations of the initial process of rarefying osteitis with progressive extension to:

- osseous cortex,
- all osseous structure and
- adjacent soft tissues.

13.3.2. NEIGHBORHOOD COMPLICATIONS OF DENTAL CARIES

The evolution of rarefying osteitis to a suppurative process, lead sometimes to fistulas apparition as a spontaneous drain solution rarely seen today due to precocious adequate and specific antibiotic therapy.

Inflammatory involve of maxillary sinuses cavities lead to appearance of odontogenic sinusitis, usually with high incidence, representing a neighborhood complications of extensive dental caries, due to an anatomic directly relations of superior premolars and molars apex with the floor of maxillary sinuses.

Appear inflammatory sinuses reactions of acute type as radiologic minimum radioopacity due to mucosal thickening and hyperemia with possible suppurative evolution when appear:

- intense radioopacity
- with or without a horizontal hidro-aeric level.

The dragging development of inflammatory sinuses process will determine a chronic evolution with “in frame” thickening of sinuses mucosa, pseudopolypoid aspect and sometimes sinuses wall osteolysis.

13.3.3. DISTANCE COMPLICATIONS OF DENTAL CARIES

Appear by infectious and allergic complex mechanisms being interested soft tissues structures with inflammatory specific entities as:

- Arthritis,
- Endocarditis,
- Glomerulonephritis, etc.

