

L.17 Common Diseases of Teeth and Supporting Structures

By

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Dental Caries:

Caries is detected radiographically only in the advanced stages when there is sufficient decalcification of tooth structures.

The radiographic appearance of caries is not representative of its actual size, that is, it is much larger clinically than seen on a radiograph.

Initial carious lesions are not readily visualized on a radiograph because the visibility of caries is determined by the ratio of enamel to caries through which x-rays penetrate.

Radiography:

Carious lesions are detectable radiographically when there has been enough demineralization to allow it to be differentiate from normal.

On average they have around 50% to 70% sensitivity in detecting carious lesions.

40% demineralization is required for definitive decision on caries.

Bite-wing and parallel radiographs are more useful in caries detection more than bisecting technique because incorrect horizontal or vertical angulation of the x-ray beam can result in a number of illusions.

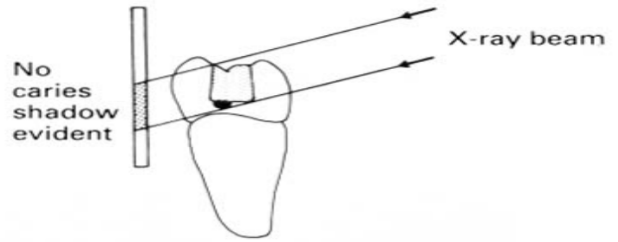
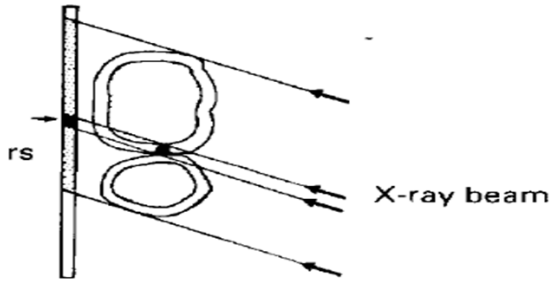
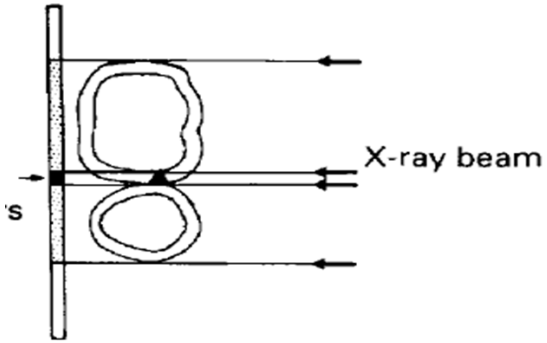
They are valuable in detecting proximal caries which may go undetected during clinical examination.

Also, errors in exposure factors and errors in processing can produce radiographic illusions of dental caries.

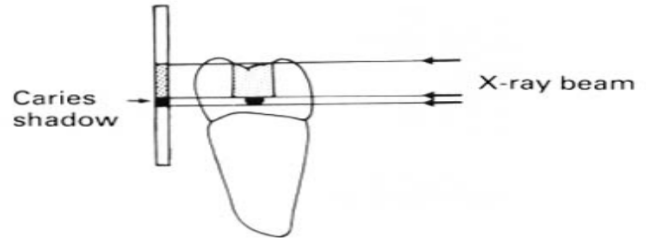
A radiographic diagnosis of caries must always be supplemented with a careful clinical examination.

Radiolucent cervical burn-out: This radiolucent shadow is often evident at the neck of the teeth. It is an artefactual phenomenon created by the anatomy of the teeth and the variable penetration of the X-ray beam.

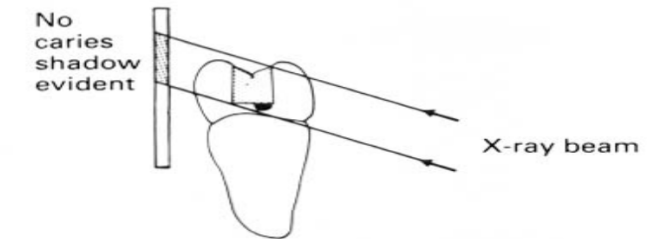
Beam angulation effects on caries
(bite-wing, parallel)



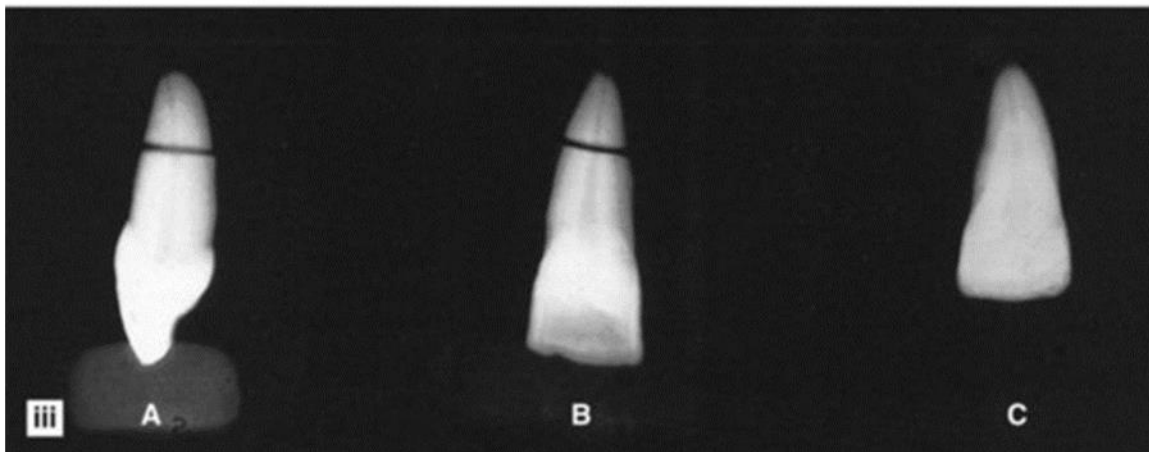
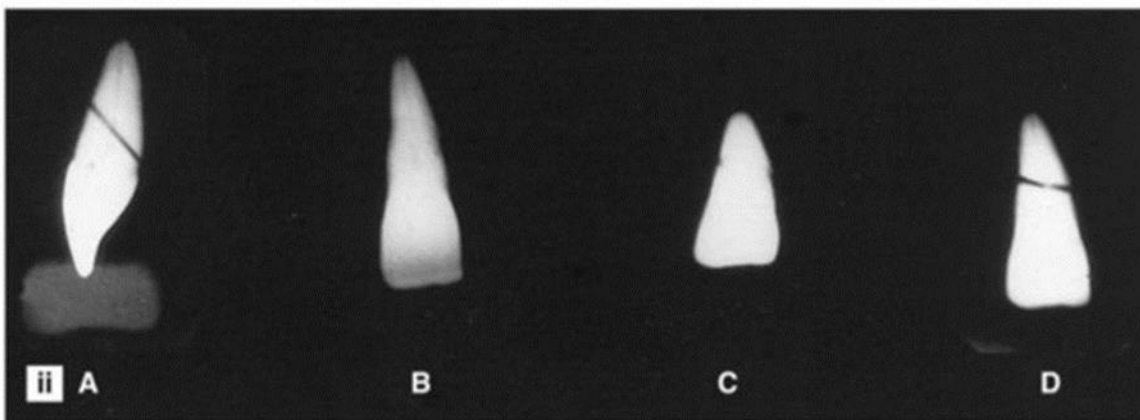
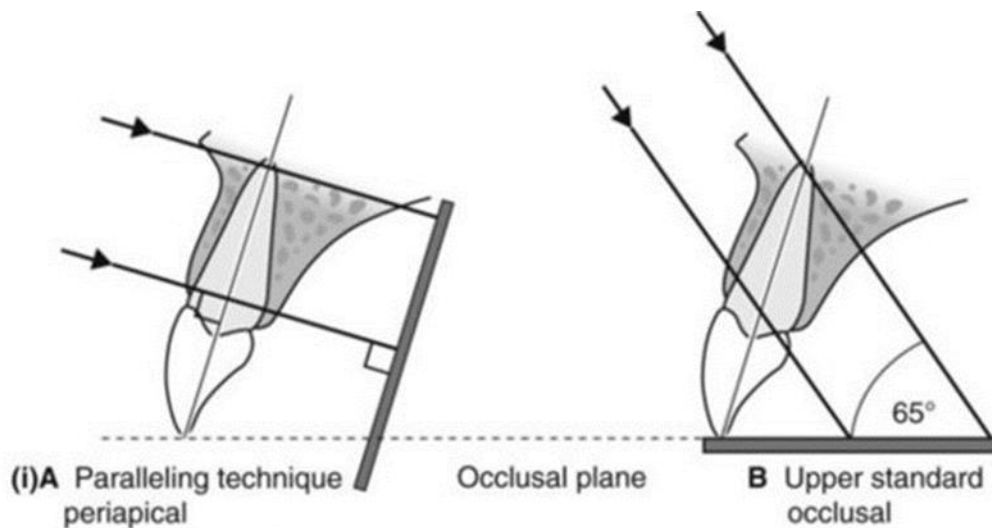
A Incorrect vertical X-ray beam angulation



B Ideal vertical X-ray beam angulation



C Incorrect vertical X-ray beam angulation



(i) Diagram showing the difference in vertical angulation of the X-ray tubehead: A for a paralleling technique periapical; B an upper standard occlusal of the maxillary incisors. (ii) The different radiographic appearances of a tangential root fracture using different projections: A from the side showing the direction of the fracture and separation of the fragments; B using a horizontal X-ray beam; C using a steeply angled (75°) X-ray beam; D using an angled (65°) X-ray beam. (iii) The different radiographic appearances of a horizontal root fracture: A from the side; B using a horizontal X-ray beam; C using an angled (65°) X-ray beam.

1. Occlusal Caries:

The spread of caries in the enamel follows the path of the enamel rods and produces a triangular appearance with the base of the triangle at the dentino-enamel junction and the apex of the triangle towards the occlusal surface of the tooth.

In the dentin, the occlusal caries follows the path of the dentinal tubules and forms another triangular radiolucency but with the base of the triangle at the dentino-enamel junction and the apex towards the dental pulp.

Occlusal caries progresses to form two triangular areas with a common base at the dentino-enamel junction. The caries follow the path of dentinal tubules.

2. Proximal Caries:

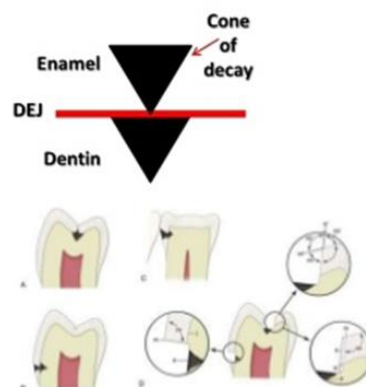
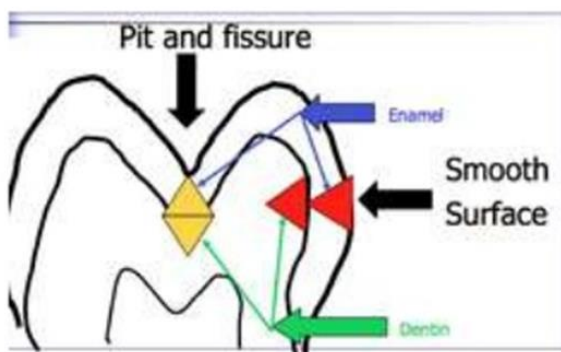
Initially detected on a radiograph by a small notching on the enamel surface just below the proximal contact point.

It continues to demonstrate approximately a triangular pattern with its base towards the outer surface of the tooth and with a flattened apex towards the dentino-enamel junction.

After reaching the dentino-enamel junction, the carious lesion spreads along the junction and forms a second base.

From this second base, the caries proceeds towards the pulp along the path of the dentinal tubules and forms another triangular radiolucency with the apex towards the pulp.

Progression



3. Facial and Lingual Caries:

Facial, buccal, and lingual caries; originate in pits and grooves on the facial and lingual surfaces of gingival free margin.

The radiographic radiolucency is well demarcated from the surrounding sound tooth structure (presence of well-defined non-cariou enamel around radiolucency).

They start as round lesions and enlarge to become elliptical or semilunar. When superimposed on DEJ, they may mimic occlusal caries. Clinical examination helps in definitive diagnosis.

4. Root Caries (Cemental Caries):

Root surface caries (also called cemental caries) involves both cementum and dentin.

On a radiograph, root caries produces a saucer shaped (scooped-out) appearance.

It does not occur in areas covered by a well-attached gingiva.

5. Recurrent Caries:

Recurrent caries is that which recurs in a previously treated and restored tooth. The caries may occur under a restoration or along its margins.

Recurrent caries may sometimes be misdiagnosed as (the non-commercial paste) of calcium hydroxide lining used underneath an amalgam and zinc phosphate base.

On a radiograph, calcium hydroxide produces a thin radiolucent line whereas recurrent caries produces a diffuse radiolucency.

Radiation Caries:

Radiation caries resulting from xerostomia caused by serial head and neck radiation therapy.

Radiation Induced Caries:

1. Lack of production of saliva.
2. Increased acidity.
3. Decrease in secretory immunoglobulin A.
4. Loss of buffering capacity.
5. Shift towards cariogenic flora.
6. Reduced remineralizing potential.

Radiolucent Cervical Burn Out:

An artefactual phenomenon created by the anatomy of the teeth and the variable penetration of the X-ray beam.

Location: located at the neck of the teeth, demarcated above by the enamel cap or restoration and below by the alveolar bone level.

Good alveolar bone height will enhance cervical burn-out.

It is triangular in shape being less apparent at the center of tooth.

Usually all the teeth on the radiograph are affected, especially the smaller premolars.

Benefits of Radiographs in Periodontal Disease:

Despite its limitations, periodontal examination is incomplete without accurate radiographs, which can show most bony changes in association with periodontal disease.

Early Radiographic Changes in Periodontitis:

Radiograph is not sensitive enough to detect the earliest signs of periodontal disease. Glickman listed the sequence of early radiographic changes that occur in periodontitis as:

Crestal irregularities: The crest of the interdental bone becomes rough and irregular along with indistinctness and interruption in the continuity of the lamina dura seen along the mesial or distal aspect of the interdental alveolar crest.

Triangulation: Triangulation is the widening of periodontal membrane space along either mesial or distal aspect of the interdental crestal bone.

The sides of the triangle are formed by lamina dura and the root and the base is toward the crown.

Interseptal bone changes: One of the earliest radiographic signs of periodontitis is the finger-like radiolucent projections extending from the crestal bone into the interdental alveolar bone.

These projections are result of a deeper extension of the inflammation from the connective tissue of the gingiva.

They represent widened blood vessel channels within the alveolar bone that allow for the passage of inflammatory fluid and cells into the bone.

Evaluation of Bone Loss:

The radiograph actually indicates the amount of bone remaining and the amount of bone loss attributed to periodontal disease can be estimated indirectly as the difference between the physiologic bone level and the height of remaining bone.

Bone loss can be determined in terms of:

Distribution: When the bone loss occurs in isolated areas, with less than 30% of the sites involved, it is described as localized bone loss.

When the bone loss is evenly distributed throughout the dental arches, with more than 30% of the sites involved, it is called generalized bone loss.

Pattern: When the bone loss occurs on a plane that is parallel to a line drawn from CEJ of a tooth to that of an adjacent tooth, it is called horizontal bone loss.

When the bone loss occurs on a plane that is at an angle to a line drawn from CEJ of a tooth to that of an adjacent tooth, it is called vertical or angular bone loss.

Severity: Bone loss viewed on a dental radiograph can be defined as slight bone loss (1 to 2 mm), moderate bone loss (3 or 4 mm) and severe bone loss (5 mm or greater).

Furcation Involvement:

Extension of the periodontal pocket between the roots of multi rooted teeth is called furcation involvement.

Radiographs can be helpful in locating furcation involvement; however, the furcation involvement will not be seen unless the bone resorption extends apically beyond the furcation.

Mandibular molar furcation is much more sharply defined than the maxillary molar furcation where the palatal root is superimposed over the furcation.

Widening of the PDL space at the apex of the interradicular bony crest of the furcation is strong evidence that the periodontal disease process involves the furcation.

If sufficient bone loss has occurred on the lingual and buccal aspects of a mandibular molar furcation, the radiolucent image of the lesion becomes prominent.

Predisposing Factors:

Dental radiographs play a major role in the detection of local irritants, such as *calculus and defective restorations*:

Calculus appears radiopaque on a dental radiograph often appearing as pointed or irregular radiopaque projections extending from the proximal root surfaces.

Calculus may also appear as ring like radiopacity encircling the cervical portion of a tooth a nodular projection or a smooth radiopacity on a root surface.

The diagnosis of absence or presence of calculus deposits should not be based on radiographic interpretation, since small deposits are not visible in radiographs.

Gross proximal caries and root surface caries may be seen in conjunction with periodontal bone loss.

Defective restorations act as contributing factors to periodontal disease. Radiographs are useful in detecting defective margins of restorations.

However, if there is excessive vertical or horizontal angulation of the central X-ray beam, there is a risk of underestimating, but not overestimating the size of the defective margin.

Chronic Periodontitis:

Both localized and generalized chronic periodontitis are characterized by pocket formation and/or gingival recession, both clinically detectable without radiographs.

Chronic periodontitis can be divided into:

1. Localized, if less than 30% of available sites display clinical attachment loss.
2. Generalized if more than 30% of sites display clinical attachment loss.

This differentiation is made on the basis of clinical findings and so radiographs are not required, although radiographs may be used like.

Aggressive Periodontitis:

Aggressive periodontitis refers to periodontal disease of an aggressive and rapid nature that usually occurs in patients below 30 years. Its cause is not known;

The radiographic appearance of the bone loss in localized aggressive periodontitis typically consists of deep vertical defects. Maxillary teeth are involved slightly more and a strong left-right symmetry is common.

Generalized aggressive periodontitis can involve a variable number of teeth, from the least three to all of the dentition, and by definition is not confined to the first molars and incisors. The rapid bone loss may be of the vertical or horizontal pattern.

Perio-endo Lesion:

This entity that may present clinically in a variety of ways is incompletely understood. It refers to teeth (typically molars) that have concurrent clinical and radiological signs of disease of periodontal and pulpal origin.

It may arise as a result of infection in a necrotic pulp draining via the periodontal ligament (usually in the presence of existing periodontal disease), toxins from pulp reaching PL space via lateral or accessory canals, especially in the furcation region and the root perforation.

Prognosis:

Prognosis based on radiographic information is considered well if:

1. The destructive process is not generalized.
2. Only a limited amount of bone has been lost.
3. Corrective etiologic factors can be identified.
4. The patient's general health is good and,
5. Most importantly the patient is motivated to save the remaining teeth and is capable of performing all routine and specialized home-care procedures.

Limitations of Radiographs in Periodontal Disease:

Radiographs may provide an incomplete presentation of the status of the periodontium. Some of the important limitations of radiographs are:

1. The condition of gingiva cannot be predicted from the radiographic appearance of alveolar crest.
2. Radiographs provide two-dimensional views of three dimensional situations. They often fail to disclose osseous destruction particularly that confined to the buccal or lingual surfaces of teeth.
3. Radiographs typically show less severe bone destruction than is actually present.

4. Measure of bone level from the CEJ is not valid when there is over eruption or severe attrition with passive eruption.
5. Facial, buccal, and lingual caries originate in pits and grooves on the facial and lingual surfaces of gingival free margin.
6. The radiographic radiolucency is well demarcated from the surrounding sound tooth structure (presence of well-defined non-carious enamel around radiolucency).
7. They start as round lesions and enlarge to become elliptical or semilunar.

Periapical Diseases:

The most common pathologic conditions that involve teeth are the inflammatory lesions of the pulp and periapical areas.

1. Acute Apical Periodontitis.
2. Chronic Apical Periodontitis.
3. Chronic Apical Periodontitis (Periapical Granuloma).
4. Periapical Abscess (Dento-Alveolar abscess, Alveolar Abscess).
5. Radicular cysts:
 - a. Periapical Cyst: These are the radicular cysts which are present at root apex.
 - b. Lateral Radicular Cyst: These are the radicular cysts which are present at the opening of lateral accessory root canals of offending tooth.
 - c. Residual Cyst: These are the radicular cysts which remains even after extraction of offending tooth.
6. Apical scar.
7. Condensing osteitis.
8. Cementomas.

Acute Apical Periodontitis:

Radiographic features: Early apical change widening of the radiolucent periodontal ligament space (no radiographic evidence of an apical lesion and loss of the radiopaque lamina dura).

Chronic Apical Periodontitis (Periapical Granuloma):

They are the most common periapical lesions and constitute approximately 50% of all periapical radiolucent lesions.

Radiographic Features:

1. Thickening of PDL at root apex.
2. As concomitant bone resorption & proliferation of granulation tissue appears to be radiolucent area.
3. Thin radiopaque line or zone of sclerotic bone sometimes seen outlining lesion.
4. Long standing lesion may show varying degrees of root resorption.

Periapical Abscess (Dento-Alveolar abscess, Alveolar Abscess):

Approximately 2% of all periapical radiolucent lesions. An apical abscess in the acute stage, the onset of infection is so sudden that there is no radiographic evidence of an apical lesion. An apical abscess can develop also from a pre-existing granuloma or cyst.

Radiographic Features:

1. Slight thickening of PDL space.
2. Large radiolucent area at apex of root with diffuse irregular borders.

Radicular Cyst:

Approximately 40% of all periapical radiolucent lesions at the apex of an untreated asymptomatic tooth with a nonvital or diseased pulp.

Radiographic Features:

1. Classically presents as round / ovoid radiolucency with sclerotic borders and associated with pulpally affected tooth.
2. Rarely induce resorption of affected teeth.

Apical Scar:

It is an area at the apex of a tooth that fails to fill in with osseous tissue after endodontic treatment.

Radiographic Features:

1. Well circumscribed radiolucency.
2. When observed radiographically over the years, it will either remain constant in size or diminish slightly.

Condensing Osteitis:

It is an unusual reaction of bone to a mild bacterial infection entering the bone through a carious tooth in persons who have a high degree of tissue resistance.

Instead of destruction, proliferation of bone takes place.

The sclerosing bone is not attached to the tooth and remains after the extraction of the tooth. No surgical removal is needed.

Periapical Cemental Dysplasia, Apical Cemental Dysplasias, Apical Cementomas:

All the three types of cementomas have three radiographic appearances:

1. Early or osteolytic stage appears radiolucent.
2. Mixed or cementoblastic stage appears as a radiolucency containing radiopacities.
3. Final or calcified stage appears as a homogeneous radiopacity surrounded by a thin radiolucent border.

All cementomas are associated with teeth having vital pulps unless, otherwise involved with caries or trauma.

Tooth Root Fractures:

Most of the horizontal fractures confined to the root occur in the middle third of the root. Longitudinal (vertical) root fractures are relatively uncommon but are most likely in teeth with posts that have been subjected to trauma.

The ability of an image to reveal the presence of a root fracture depends on the relative angulation of the incident x-ray beam to the fracture plane and the degree of distraction of the fragments.

If the x-ray beam is well aligned with the fracture plane, a single sharply defined radiolucent line confined to the anatomic limits of the root may be seen.

If, however, the orientation of the x-ray beam is not well aligned and meets the fracture plane in a more oblique manner, the fracture plane may appear as a more poorly defined single line or as two lines that converge at the mesial and distal surfaces of the root.

The appearance of a comminuted root fracture may also appear less well defined.

Most nondisplaced root fractures are usually difficult to demonstrate radiographically, and several views at differing angles may be necessary.

In some instances when the fracture line is not visible, the only evidence of a fracture may be a localized increase in the width of the periodontal ligament space adjacent to the fracture site.

The width of the fracture plane tends to increase with time, probably because of resorption of the fractured surfaces.

Over time calcification and obliteration of the pulp chamber and canal may be seen.

Tooth Resorption:

Physiologic root resorption:

The roots of a deciduous tooth undergo resorption before the tooth exfoliates. This is a normal physiologic phenomenon. Resorption can occur with or without the presence of a permanent successor tooth.

Idiopathic tooth resorption:

Idiopathic tooth resorption is resorption that occurs either on the internal or external surface of a tooth from an obscure or unknown cause.

Pathologic tooth resorption:

Pressure exerted by an impacted tooth produces a smooth resorbed surface on the adjacent tooth.

Apical infection produces an irregular resorbed root surface with destruction of the periodontal membrane and lamina dura.

Neoplasms of expansive nature tend to produce smooth tooth resorption (for example, odontomas, and slow growing ameloblastomas).

Trauma produces irregular tooth resorption.

Pulp Calcification:

Pulp stones (denticles):

As round or ovoid opacities within the pulp. They may be free within the pulp or attached to the inner dentinal walls.

Secondary or reparative dentin:

Calcified layer between normal pulp tissue and a large carious lesion. It is frequently associated with the successful use of calcium hydroxide as a pulp-capping material.

Pulpal obliteration (calcific metamorphosis of dental pulp):

Pulpal obliteration is the partial or complete calcification of a pulp chamber and canal.

Post Developmental Loss of Structure:

What are the different causative factors between the wearing down of teeth caused by attrition, abrasion, erosion, and abfraction?

Attrition: tooth to tooth contact.

Main factors are:

1. Poor quality or absent enamel.
2. Premature contacts.
3. Intra oral abrasive.
4. Erosions and grinding habits.

Abrasion: Pathological loss of tooth structure or restoration secondary to the mechanical action of an external agent (a foreign object to tooth contact).

Common causes are:

1. Hard tooth brush with abrasive tooth paste.
2. Chewing tobacco, biting nails or pencil.

Radiographic Findings of Erosion:

The findings appear as radiolucent defects on the crown with well-defined or diffused margins.

Abfraction: It appears as wedge shaped defects limited to the cervical area of the teeth and may closely resemble cervical abrasion or erosion.

Common cause is:

Occlusal stress leading to excessive tensile forces, which cause damage to enamel at cervical areas of the teeth.

Impacted teeth:

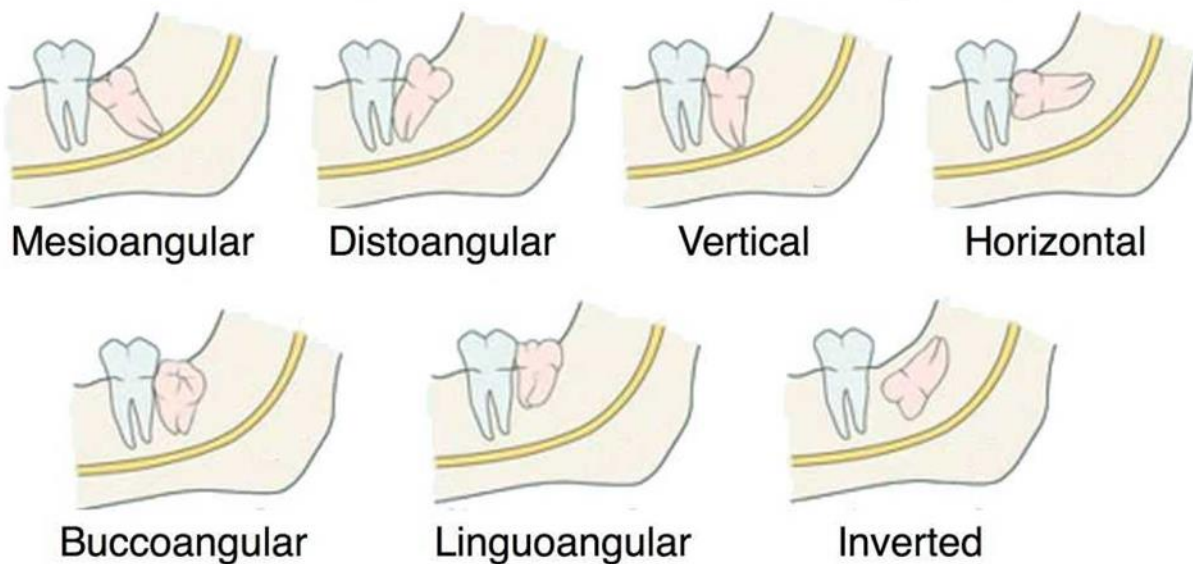
An impacted tooth is a tooth which is prevented from erupting due to crowding of teeth or from some physical barrier or an abnormal eruption path. An embedded tooth is one which has no eruptive force.

Tooth impaction may be vertical, horizontal, mesioangular (crown tipped mesially) or distoangular (crown tipped distally).

Mandibular third molar is the most commonly impacted tooth; followed by the maxillary third molar, maxillary cuspid and premolar.

A retained impacted tooth has the potential to develop a dentigerous cyst or a neoplasm (ameloblastoma).

Classifications of Wisdom Tooth Impaction



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