ORAL PATHOLOGY

Lecture 2

Disorders of the dental pulp

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 **PULPITIS**: An inflammation of the pulpal tissue that may be acute or chronic, with or without symptoms, and reversible or irreversible. The diagnosis is based on the ability of the clinician to properly assess the patient’s history and clinical signs and symptoms.

The decision to be made is one of the following:

1. To restore the defective tooth structure conservatively,
2. To remove the diseased pulpal tissue, or
3. To remove the entire tooth.

Pulpitis is the name given to any inflammation of the pulp regardless of the presence of an infectious agent.

## Causes of Pulpitis

Four main types of noxious stimuli are common causes of pulpal inflammation:

1. Mechanical damage: Mechanical sources of injury include traumatic accidents (crown and root fractures), iatrogenic damage from dental procedures, attrition, abrasion, and bruxism.
2. Thermal injury: Severe heat generation can be transmitted through large uninsulated metallic restorations or may occur from such dental procedures as cavity preparation, depth of preparation and polishing.
3. Chemical irritation: Chemical-related damage can arise from erosion or from the inappropriate use of acidic dental materials.
4. Bacterial effects: Bacteria can damage the pulp through toxins or directly after extension from caries or transportation via the vasculature and periodontal pockets.

The best classification system for pulpitis is:

* 1. Reversible pulpitis denotes a level of pulpal inflammation in which the tissue is capable of returning to a normal state of health if the noxious stimuli are removed.
	2. Irreversible pulpitis implies that a higher level of inflammation has developed in which the dental pulp has been damaged beyond the point of recovery.

To differentiate between reversible and irreversible pulpitis, the following must be assessed:

1. Whether the pain is spontaneous or brought on by thermal changes.
2. The duration of each episode of pain.
3. The nature of the pain as described by the patient.

# REVERSIBLE PULPITIS

The diagnosis of reversible pulpitis implies that the pulp is capable of a full recovery if the irritating factors subside or are removed.

The symptoms reflect an irritated pulp tissue that reacts with the mildest and earliest forms of the inflammatory response, consisting of vasodilation, a slight infiltrate of lymphocytes, and disruption of the odontoblastic layer. Tertiary dentin may be noted in the adjacent dentinal wall.

Reversible pulpitis: Mild transient pulpal inflammation that occurs immediately after the placement of a deep restoration.

# IRREVERSIBLE PULPITIS:

The diagnosis of irreversible pulpitis is made when it is determined that the pulp will most likely not recover, regardless of the attempts to treat it.

The pulpal tissue will exhibit a wide spectrum of acute and chronic inflammatory changes.

Irreversible pulpitis: A focal area of acute inflammation (pulpal abscess) in a tooth with advanced recurrent caries.

Patients with irreversible pulpitis generally have:

* Sharp, severe pain on thermal stimulation and the pain continue for a longer period of time after the stimulus is removed.
* Cold is especially uncomfortable, although heat or sweet and acidic foods also can elicit pain.
* The pain may be spontaneous or continuous and may be exacerbated when the patient lies down.
* The pain can be localized easily to the individual offending tooth; with increasing discomfort unable to identify the offending tooth within a quadrant.

## Histopathologic Features:

A spectrum of histologic changes takes place between a normal and a necrotic pulp. Irreversible pulpitis often demonstrates congestion of the venules that results in focal necrosis. This necrotic zone contains polymorphonuclear leukocytes. The surrounding pulp exhibits fibrosis and a mixture of plasma cells, lymphocytes and histocytes. Irreversible pulpitis is either acute partial or total pulpitis, chronic partial or total pulpitis.

# HISTOPATHOLOGY OF PULPAL DISEASE:

Factors that modified the inflammatory process in the pulp are including:

🗷 The nature and severity of the insult.

🗷 The efficiency of the host defense mechanisms, and

🗷 Its special anatomical location.

Because the pulp is almost totally surrounded by dentine with a limited blood supply through the apical foramen and no collateral support, the inflammatory process is so beneficial in the healing process than in other parts of the body becomes a mechanism of destruction in this confined location.

Inflammation is process consisting of dilation of blood vessels, leakage of fluids from blood vessels into the surrounding connective tissue, and migration of cells into the immediate area which limits the ability of the pulp to tolerate oedema.

The pressure rise in the pulp associated with inflammatory exudates may cause local collapse of the venous part of the microcirculation, result in pain because of the internal pressure and strangulation of the blood supply. This leads to local tissue hypoxia which in turn may lead to localized necrosis.

Local buildup of pressure is not inevitable because of drainage of the fluid exudate via the lymphatics.

Chemical mediators released from the necrotic tissue lead to inflammation and oedema, and total necrosis of the pulp may follow the continued spread of local inflammation. This predisposes to suppuration due to the progressive accumulation of neutrophil leucocytes which release their lysosomal enzymes when they die. Suppuration may be local, forming a pulp abscess.

## Chronic pulpitis

A clinical diagnosis of chronic pulpitis is associated with spontaneous attacks of dull aching pain.

An absence of symptoms is not even evidence of a normal pulp as pulp death following pulpitis may occur with no previous history of pain. This is often the situation in older teeth because most of these teeth have

had previous restorations or a slowly progressive form of caries.

The histologic feature of a chronic pulpitis is caused by a low-grade irritant. Chronic pulpitis reveals the presence of loose, delicate connective tissue with bundles of dense collagen and a severe reduction in both the size and number of the vascular structures and peripheral nerves. A diffuse infiltrate of lymphocytes and plasma cells exists throughout the pulp.

## Chronic Hyperplastic Pulpitis

One unique pattern of pulpal inflammation is chronic hyperplastic pulpitis (pulp polyp). This condition occurs in children and young

adults who have large exposures of the pulp in which the entire dentinal roof often is missing.

The most frequently involved teeth are the deciduous or permanent molars, which have large pulp chambers in these age groups.

Mechanical irritation and bacterial invasion result in a level of chronic inflammation that produces hyperplastic granulation tissue that extrudes from the chamber and often fills the associated dentinal defect. The apex may be open and reduces the chance of pulpal necrosis secondary to venous compression. The tooth is asymptomatic except for a possible feeling of pressure when it is placed into masticatory function.

## Histopathologic features:

Chronic hyperplastic pulpitis demonstrates a cap of subacutely inflamed granulation tissue that fills the entire space of the original pulp chamber. The surface of the polyp may or may not be covered with stratified squamous epithelium, which migrates from the adjacent gingiva or arises from sloughed epithelium within the oral fluids. The deeper pulp tissue within the canals typically demonstrates fibrosis and a chronic inflammatory infiltrate.

# COMMON DIAGNOSTIC TECHNIQUES

The diagnostic procedures that are commonly used to assess the status of a symptomatic tooth and pulp are as follows:

1. History and nature of pain
2. Reaction to thermal changes
3. Reaction to mild electric stimulation
4. Reaction to tooth percussion
5. Radiographic examination: A radiograph is of little use in evaluating the extent of changes within the pulpal chambers.
6. Visual clinical examination: A visual clinical examination may reveal an expansion of the cortical plates of the alveolar bones.
7. Palpation of surrounding area

## Treatment and Prognosis

Reversible pulpitis is treated by removal of the local irritant. The prognosis of reversible pulpitis is good if action is taken early enough. The pulp status should be evaluated periodically over the next 3 months to ensure that healing has occurred and the process has not progressed to irreversible pulpitis or necrosis.

Irreversible and chronic hyperplastic pulpitis are treated by extraction of the tooth or by root canal therapy.

## Pulp calcification

Pulp stones (or denticles) are calcified bodies with an organic matrix and occur most frequently in the coronal pulp.

**True pulp stones** contain tubules and may have an outer layer of predentine and adjacent odontoblasts.

**False pulp stones** are composed of concentric layers of calcified material with no tubular structure.

According to their location in the pulp, stones may be described as free, adherent, or interstitial when they have become surrounded by reactionary or secondary dentine.

Pulp stones increase in number and size with age and are apparently more numerous after operative procedures on the tooth. They do not cause symptoms, although neuralgic pain has sometimes been attributed to their presence.

**Dystrophic calcifications** in the pulp consist of granules of amorphous calcified material which may be scattered along collagen fibers or aggregated into larger masses. They are most commonly found in the root canals. Dystrophic calcifications and pulp stones may obstruct endodontic therapy.

Pulp obliteration may follow traumatic injury to the apical blood vessel which is not sufficient to cause pulp necrosis. Large quantities of irregular dentine form in the pulp chamber and root canals which become obliterated.

## Pulp necrosis:

Pulpal necrosis is the term applied to pulp tissue that is no longer living. Pulp necrosis may follow either pulpitis or a traumatic injury to the apical blood vessels cutting off the blood supply to the pulp.

A coagulative type of necrosis is seen after ischemia, but if the necrosis follows pulpitis then breakdown of inflammatory cells may lead to a liquefactive type of necrosis which may become infected by putrefactive bacteria from caries.

If this is the result of a sudden traumatic event, in which the blood supply has been severed, the patient will often have no symptoms for a time.

The first sign of non-infected pulpal necrosis may be a change in the coloration of the tooth.

This is the result of the decomposing tissue debris and breakdown products of the red blood cells entering the open ends of the empty dentinal tubules and becoming distributed throughout the dentin. This process alters the translucency of the tooth after that tooth has become non-vital.

## Age changes in the pulp:

The volume of the pulp gradually decreases with age due to The continued production of secondary dentine,

Decreased vascularity, Reduction in cellularity and

Increase in collagen fiber content have also been reported, and these changes may impair the response of the tissue to injury and its healing potential.

The reduction in pulp cell density is accompanied by reduction in the number of odontoblasts throughout adult life to about half their original number by age 70. The reduction is greater in the root than in the crown.