

Operative

Type of irritants to the pulp

Dr. Firas Albaaj

Pulp irritants:

Like other soft tissues, the pulp reacts to irritants with an inflammatory response. The pulp irritants can be classified according to the cause of irritant:

- 1-bacterial
- 2-Physical
- 3-Irradiation
- 4-Chemical
- 5-Idiopathic

I-Bacterial irritant:

1-Caries:

Carious dentin and enamel contain numerous bacteria such as *Streptococcus mutans*, *Lactobacilli*, and *Actinomyces*. The population of microorganisms decreases to few or none in the deepest layers of carious dentin. Many studies have been shown that even early enamel caries lesions that extend less than one fourth of the way to the dentinoenamel junction induce pulpal reaction especially when the caries lesion has advanced rapidly. This may be related to an increase in the permeability of enamel, allowing the transmission of stimuli along enamel rods. However, direct pulp exposure to microorganisms is not a prerequisite for pulpal response and inflammation. Microorganisms in caries produce toxins that penetrate to the pulp through tubules. As a result of microorganisms and their by-products in dentin, pulp is infiltrated locally primarily by chronic inflammatory cells. As a lesion progresses deeper into the tooth, pulpal reaction increases and the intensity and character of infiltrate change. The outward flow of fluid through dentinal tubules does not prevent bacteria or

their toxins from reaching the pulp and initiating pulpal inflammation. The extent of pulpal inflammation beneath a carious lesion depends on the depth of bacterial invasion as well as the degree to which dentin permeability has been reduced by dentinal sclerosis and reparative dentin formation and the time of irritant.

2-Contaminated of an exposure pulp by microorganisms:

When actual pulpal invasions by bacteria and/ or their toxins occur, severe inflammation occurs and is infiltrated locally by PMN leukocytes to form an area of liquefaction necrosis at the site of exposure. Pulpal tissue may stay inflamed for long periods and may undergo necrosis eventually or become necrotic quickly.

3-Periodontal disease:

Periodontal disease may extend to the pulp through the accessory canals, the apical foramen, and open dentinal tubules. The inflammatory changes of the pulp occur when teeth have many accessory canals or when periodontal defect has progressed to the apex.

Many studies concluded that the accumulative effect of P.D.D. has a damaging effect on the pulp, as indicated by the presence of pulp calcification, inflammation, or resorption, but total pulp disintegration is certain only when the apical foramen is infected.

Root curettage can result in pulp devitalization. During curettage of a periodontal lesion that extends around the apex of a root, the pulp vessels may be severed, and the pulp devitalized.

II-Physical irritant:

1- Mechanical

A- Tooth preparation (caries removal or crown preparation).

Pulp trauma results when the pulp is closely approached, or the dentin is extensively removed. Over cutting during cavity preparation, whether a pulp is exposed or not is one of the greatest damages to the pulp. Not only the depth of cavity affects the pulp, but also the width of the cavity has the

same important. Pulpal damage is roughly proportional to the amount of tooth structure removed as well as to the depth of removal. Also, operative procedures without water coolant cause more irritation than those performed under water spray.

B-Orthodontic movement:

The force of movement during orthodontic treatment creates disturbance in the circulation of the pulp that is similar to those found in periodontally involved teeth.

If the force beyond the limitation of physiologic tolerance, blood vessels in the periodontal ligaments may rupture with resultant hemorrhage which lead to loss of the nutritional supply to some pulp cells. If hemorrhage occur from larger vessels of the pulp,²⁵⁺ the entire pulp become necrotic. In addition, orthodontic movement may initiate resorption of the apex, usually without a change in vitality.

C-Tooth fracture (acute trauma):

Which occurs by either direct trauma to the tooth or indirect trauma to the jaw, in addition severe occlusal pressure to tooth with large filling can cause fracture. Fracture is related to the bacterial invasion that follows the accident. Untreated bacterial invasions will decrease any possibility of sustained vitality. If fracture occurs through the root, this will disrupt the vascular supply that injured the coronal pulp which often loses its vitality.

D-Abrasion (chronic trauma):

Is defined as loss of tooth structure by mechanical or frictional forces. These lesions are commonly caused by excessive tooth brushing, but repeated and excessive forces by other materials and appliance, such as dental floss, tooth picks, or removable appliances, may also produce defects. These lesions can progress rapidly if they occur at the cemento-enamel junction because, the enamel is thin, and the mechanical forces can wear the dentin and cementum away quickly and may also be so severe as to invade the pulp space. The lesions commonly caused by brushing appear as V- shaped notches in the labial surface.

E-Attrition:

Is a mechanical wear of the incisal or occlusal tooth structure as a result of functional or para-functional movements of the mandible (tooth grinding, or bruxism usually due to stress). Pulp death or inflammation related to the incisal wear is seldom, pulp has ability to lay down dentin, but when a severely worn tooth occurs (attrition exceed the rate of deposition of reparative dentin we can show a necrotic pulp with an observable incisal opening into the pulp chamber.

The pulp may be devitalized at an earlier time and finally reached the chamber and some time the tooth required to be crowned. It is important to determine and eliminate the cause (abrasion or attrition). If the tooth is hypersensitive so we can relief that by topical fluoride, fluoride rinse, dentinal bonding agents, or restoration.

2- Thermal

III-Irradiation irritant:

The pulp of teeth is affected in-patient who is exposed to deep radiation therapy for malignant growth in head and neck region. In time odontoblasts and other cells will necrotic, the salivary gland will be affected resulting in decreasing of salivary flow

Two new methods for tooth preparation are available:

-Laser

-Kinetic cavity preparation (air abrasion)

Laser: is device, which produces beams of very high intensity light. There are several types available based on the wavelengths. Laser used for soft and hard tissues, for soft tissue they can produce completely blood free incision followed by rapid healing. The use of a variety of lasers, including Co, Er:YAG, and free electron lasers (FEL) on tooth

structure has demonstrated minimal pulpal response , comparable to that of high-speed rotary instrumentation.

The effect of laser depends on 1- power of beam 2- extent to which beam absorbed. When we used laser for cutting of enamel and dentin the process would generate heat, which might affect the pulp so it should be used in pulsating manner (not continuously).

- Air abrasion

Air abrasive cutting generating heat, difficult for operator to determine the cutting progress within the cavity preparation.

Air abrasive equipment is being used for stain removal and cleansing pit and fissure before sealing. Animal studies have shown that air abrasion cavity preparation is no more traumatic to the pulp than rotary instrumentation.

IV- Chemical irritant:

1-Cleansing agents:

Are used to reduce microorganisms on the cut surface of dentin and to remove the smear layer that remains on the dentin after cavity preparation. When we remove this smear layer a liner or cement would adapt better to the cut surface of dentin. Cleansing agents contain either an acid or a chelating agent such as ethylenediamine-tetraacetic (EDTA). The incidence of pulpal inflammation increased when cavities were treated with an acid cleansing agent before being filled. Acid cleansing agents greatly increase the permeability of dentinal tubules thus enhancing penetration of the dentin by irritating substances.

2-Drying agents:

Cavity drying agents generally contain organic solvents such as ether and acetone. Solvents- containing agents should not be used in very deep cavities, since these agents are capable of damaging odontoblasts processes and cells of the pulp, so we used it in shallow to moderately deep cavities.

3-Erosion:

Has been defined as loss of tooth structure due to chemical action. Thus, erosion of facial or lingual cervical tooth structure may create lesions. This can be a prominent in-patient with oral habits such as constant citrus ingestion, continues exposure to airborne acids, or gastrointestinal problems that produce repeated exposure of teeth to gastric acids. In these cases, the oral lesions generally present a rounded, cupped-out defect initially confined to the enamel, if left untreated, the loss of tooth structure due to the chemical attack will accelerate once dentin has been reached, and deeper pattern of destruction will be seen

THANK YOU