

Restorative Dentistry and Pulpal Health

Pulp is a viscous connective tissue of collagen fibers and ground substance supporting the vital cellular, vascular, and nerve structures, of the tooth. The pulp contains blood vessels and nerves that enter through the apical foramen.

Effect of Operative Procedures on the Pulp:

The commonly used operative procedures endanger the pulp more than the disease process. Pulp inflammation for which the dentists own procedures are responsible and may well be designated as (dentistogenic pulpitis), dentist induced pulpitis.

1-Effect of Local Anaesthetic on the Pulp:

Vasoconstrictors of LA potentiate and prolong anesthetic effect by reducing blood flow in the area. Reduction in blood flow during a restorative procedure could lead to an increase in the concentration of irritants which accumulating within the pulp.

2-The Effect during Cutting Procedures:

Pulp trauma results when the pulp is closely approached or the dentine is extensively removed in all type of preparation in teeth, for amalgam, composite, inlay and crown preparation. Over cutting cavity preparation (whether or not the pulp exposure occur) is one of the greatest damage to the pulp. A full crown preparation damages every single coronal odontoblast.

So the depth of cavity affects the pulp as well as the width of the cavity also of the same importance.

The immediate reaction of the pulp (when cutting the dentine) is the disturbance of the odontoblasts cells beneath the cut tubules of the cavity, this will be followed by an acute inflammatory reaction.

Usually, it will resolve into a repair process with subsequent reparative dentine formation.

This will depend on many factors:

a- The depth of the cavity, the deeper the cavity the more the damage to the pulp.

b- Speed of rotation, depend on whether there is water cooling or not, the more speed the more the damage unless water cooling is effective. Speeds between 3000 rpm to 30000 rpm are more damaging to the pulp if used without cooling.

c- Frictional heat, the production of heat within the pulp is the most severe stress that restorative procedures impart on the pulp. Amount of heat produced depends on speed of rotation, size and shape of the cutting instrument, length of time in contact with dentin, amount of pressure exerted on hand piece and if water-air spray is used. A water coolant is more efficient in lowering the temperature than an air coolant. For the water to be effective it must have sufficient pressure to penetrate the area of turbulence and should be delivered directly at the point of contact between the bur and the tooth.

- Temp raised 10 degrees above ambient temp; cell death occurs.

d- Rebound response due to vibration, increase in speed of rotation not only increase heat production but this is also an increase in vibration which affect the pulp, these vibration movement affect odontoblast cells and may cause displacement of these cells on the other side of the pulp.

e- Extensiveness of preparation, the pulp damage is roughly proportional to the amount of tooth structure removed.

f- The use of pins, the insertion of pins introducing the hazards of dental fractures or unnoticed pulp exposure or perforation through periodontal ligaments, also the cementation of pins with an irritant material cause more damage in the pulp.

g- Nature of cutting instrument and hand instruments, produce pressure upon manipulation during cavity preparation or crown preparation or cavity filling.

h- Drying of dentine, drying of cut dentin with a jet of air produces a rapid outward movement of fluid through the dentinal tubules. Not only does this stimulate sensory nerve fibers (pain), this fluid movement may "draw" odontoblasts up into the tubules resulting in cell death.

3- The Effect during Lining Procedures:

Materials in general used in dentistry, various filling materials produce some irritation as chemical toxicity, acidity, absorption of water during setting. In deep cavities non-irritant lining materials should be used such as $\text{Ca}(\text{OH})_2$ or ZOE.

4- The Effect during Filling Procedures:

a- Correct placement of band retainer and wedge.

b- Correct insertion of the materials to avoid micro leakage and the development of secondary caries.

c- Correct carving of the material to produce the missing part of the tooth and to prevent high spot.

d- Polishing of the restoration, should be done and avoid heat generation. Polishing of teeth with rubber cup and polishing of amalgam with pumice will produce heat if exceeds the speed and time, so water should be directed to the tooth to prevent damage due to heat.

5- The Effect After Restoration (Accumulative Effect): It should be realized that the pulp sustain damage, when involved with caries and also during the operative procedures, and may sustain further damage in the pulp after restoration which could be irreversible and it will progress to involve the whole pulp. This could give rise to painful symptoms or may proceed without causing any problem to the patient.

Irradiation Irritants to Pulp:

The pulps of human teeth are affected in patients who are exposed to deep radiation therapy for malignant growth in oral cavity and neck region. In time the odontoblasts and other pulp cells become necrotic. The salivary glands affected resulting in decreasing of salivary flow. Radiation causes pulp involvement which should be endodontically treated, extraction of teeth may cause radionecrosis of involved bone. Radium is found in human dental tissue for many years after medical occupational exposed.

Clinically Importance Features of the Dental Pulp

- With age the pulp becomes less cellular. The number of cells in the

dental pulp decreases as cell death occurs with age.

- The volume of the pulp chamber with continued deposition of dentine. In older teeth, the pulp chamber decreases in size; in some cases the pulp chamber can be obliterated.
- An increase in calcification in the pulp occurs with age.
- With advancing age, the pulp becomes more fibrous and may contain pulp stones which may be concentric attached to the pulp cavity wall or free in the mass of pulp tissue.