# **ENDODONTICS**

Lect :10

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### **Obturation of root canal system**

After chemo-mechanical debridement of root canal system by instrumentation and irrigation, the next step is complete (3 dimensional) obturation of root canal space to maintain the tooth functional within the dental arch.

The remaining non-vital pulp within incompletely debrided root canal will undergo autolysis and the disintegrated by products will diffuse into the surrounding tissue.

The fundamental aim of obturation is to provide 3 dimensional hermetic seal of root canal space to prevent the leakage from or into root canal system. The obturation method include the use of a solid or semisolid core material (gutta percha) surrounding by a sealer type of material to produce the fluid tight seat, by filling the main root canal(s), the accessory canals, voids, spaces and irregularities.

#### Aims of root canal obturation:

1-The achievement of 3 dimensional obturation of the root canal space to prevent ingress of bacteria and body fluids into root canal space, as well as egress of bacteria or their toxins out of the root canal.

2-To provide fluid tight seal within all regions of root canal space to prevent microleakage.

3-The replacement of the root canal space filled with necrotic tissue by an inert filling material to create a favorable healing environment and avoid recurrent infection.

4-To provide adequate coronal seal with proper coronal restoration to obtain long term success of root canal therapy.

Timing of obturation: Several factors should be checked before doing obturation:

**1- The sensitivity to percussion** indicative that the inflammation of the periaplcal periodontal ligament is present. Therefore, the obturation has to be postponed until the inflammation subside. In cases of irreversible pulpitis with no tenderness to percussion present. The root canal treatment can be completed in a single visit as soon as the cause of the pain and inflammation has been removed.

### 2-Canal wettability :

Presence of wet canal with purulent exudate, blood or pus is a strong evidence that the periradicular inflammation is still present. Obturation of the root canal at this stage increase the pressure within periradicular region and subsequent tissue destruction may proceed rapidly. Therefore, in cases of active periradicular infection, delaying obturation until all signs and symptoms of inflammation have to be subside is extremely recommended.

3-<u>Negative culture</u>: most of the endodontist do not relay on this test because researches have approved that the false negative results inaccurately assess the intra-canal microbial flora. Furthermore, the positive results is not an indicative for the potential bacterial pathogenicity.

#### Features of an ideal root canal obturation:

1-Complete 3 dimensional obturation from the coronal orifice of the root canal until CDJ.

2-Radiographicaity, the root filling should be within 0.5-0.75 mm from radiographical apex.

3-The root canal should be completely filled, mainly with root filling material with a minimum amount of sealer.

**Under filling:** occur when the root canal filling is shorter that total root canal space. This definitely provide an environment for initiation, persistence or recurrence of periradicular infection.

**Overfilling:** occur when the root filling material extended beyond the CDJ. According to N9 et al. 2007 the extrusion of root canal filling is considered to be acceptable within 2mm beyond (longer than) the radiographical apex, if it is associated with 3 dimensional sealing of root canal system.

# **Characteristics of an ideal root filling material:**

- 1-Easy introduced in the root canal.
- 2-Provide an apical and lateral sealing of the root canal.
- 3-Dimensionally stable after usage.
- 4-Impervious to moisture.
- 5-Bacteriostatic or at least should not encourage bacterial growth

6-Radiopaque.

- 7-Non staining to tooth structure.
- 8-Non irritating
- 9-Sterile or easily sterilized.
- 10-Removed easily from canal if required.

#### Materials used for obturation

- Plastics: Gutta-percha.
- Solids or metal cores Silver points ,gold, stainless steel titanium
- Cements and pastes:

### -MTA

-Gutta flow

## **4 <u>Gutta percha</u>**

Gutta percha :Is a natural material extracted as a dried coagulated from a Brazilian trees(PaIaqu1um) Its molecular structure is close to natural rubber. Chemically gutta percha is available into two crystalline forms: alpha and beta.

The most commercially available product is in B-form with composion following:

- Organic content: gutta percha 20% + waxes and resins 3%
- Inorganic: zinc oxide filler 66% + heavy metal sulfates as radiopacifiers 11%

### Forms of Gutta percha:

Gutta percha available in different forms. The B-form is produced as gutta percha points (cones) which is available in different sizes and tapering as follow:

1-Standard cones of the same size and shape of the ISO endodontic instruments.

2-Greater taper gutta percha points: available with taper 4%, 6%, 8% and 10%.

3-Auxiliary points: non-standard cones.

## **Properties of gutta percha:**

The Gutta percha expand on heating and increase volume which could be advantageous to compact into root canal spaces. However, Gutta percha shrink on cooling. Therefore, vertical pressure should be applied on warm gutta percha to compensate for volume loss after cooling.

- Heat sterilization is inapplicable with gutta percha. For disinfection, gutta percha points can be immersed in ethanol alcohol (96%) for one minute prior to its use.
- Because gutta percha has no adherence property, it should always be used with sealers to seal the root canal space.
- Gutta percha can be dissolved in certain chemical solvent such as chlorofom eucalyptus oil, etc. The chemically plasticized property of gutta percha is important in soften gutta percha points for better filling or in easily removal of gutta percha from the canal during re-endodontic treatment.

## Advantages of gutta percha:

1-Compatibility: adaptation to the canal wall.

- 2-Inertness: do not interact with the tissue
- 3-Tissue tolerance.
- 4-Dimensionally stable.
- 5-Radiopacity.
- 6-Plasticity: can be soften either with heat or using chemical solvent

### **Disedvantages:**

1-Lack of rigidity: can be bend easily with pressure which make its application difficult especially in narrow canals.

2-Lack of adhesiveness so it should be used with sealers and cements.

3-Easily displaced by pressure.

#### **4** <u>Silver points:</u>

Old endodontic filling points which were made from silver. They are stiff points with rounded cross section, which can be easily used in rounded and narrow canals. However, because of their sliver corrosive products, which are toxic in nature, their use have been declined nowadays. In addition, silver points are not compatibles, lacking plasticity, and cannot adhere to the canal wall.

#### **4** Root canal sealers:

Seaiers can serve several functions:

1-Lubricate and aid the seating of gutta percha cones.

2-Facilitate the bonding between gutta percha and root canal walls.

3-Filling the gaps and anatomical spaces where the primary filling cannot reach.

4-The combination between sealer and primary filling effectively increase the fluid tight seal and prognosis of endodontic treatment. However, there are some sealers (cements) that can be used as obturating material without gutta percha.

5-Antimicrobial agent: the germicidal property is exerted immediately after placement.

6-Radiopacity: this property helps to identify the presence of auxiliary canals, resorption regions, root fracture, and the shape of apical foramen.

Different types of sealers are available in the market such as: zinc oxide-eugenol formulations, calcium hydroxide sealers, glass ionomers, epoxy resin sealers, silicon sealers, bioceramics and medicated sealers. These types have different physical and biological properties. Therefore, a care should be taken to evaluate all characteristics of a sealer before selection.

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