

## Obturation of the root canal system

Objectives of canal obturation:-

- 1- Prevention of percolation of periapical exudates into the root canal space.
- 2- Prevention of reinfection of the root canal during transient bacteremia.
- 3- Creation of a favorable biological environment for the process of tissue healing.

Criteria for root canal obturation

- 1- Asymptomatic tooth.
- 2- Dry canal
- 3- No sinus tract
- 4- No foul odor
- 5- Negative culture

### Heat softened gutta-percha techniques

Warm lateral condensation

This technique depends on a heated spreader to soften the gutta-percha during lateral condensation to improve the adaptation of the gutta-percha to the wall of the root canal.

Technique

- 1- Heating the spreader is done by hot glass beads which is then inserted in the root canal.
- 2- Lateral condensation is done to create space for the accessory cones.
- 3- This procedure is repeated until the canal is completely filled.
- 4- An electrically heated spreader may be used.

Warm vertical gutta-percha filling technique

It is a method of filling the radicular space in three dimensions. The canal should be with a continuously tapering funnel and keeping the apical foramen as small as possible. The armamentarium includes a variety of pluggers and a heat source.

Technique:

- 1- The master cone should fit short of the corrected working length (0.5 to 2 mm) with resistance to displacement. This ensures that the cone diameter is larger than the prepared canal.
- 2- After the adaptation of the master cone it is removed and sealer is applied in the root canal.
- 3- The cone is placed in the canal and a heated spreader or plugger is used to remove portion of the coronal gutta-percha and soften the remaining material in the canal.
- 4- A plugger is inserted into the canal and the gutta-percha is compacted, forcing the plasticized material apically.
- 5- The process is repeated until the apical portion has been filled.
- 6- The coronal canal space is back filled, using small pieces of gutta-percha. The sectional method consists of placing 3-4 mm sections of gutta-percha approximating the size of the canal into the root, applying heat, and compacting the mass with a plugger.

### Continues Wave Compaction Technique

It is a variation of warm vertical compaction. The manufacturing of cones to resemble the tapered preparation using rotary instrumentation permits the application of greater hydraulic force during compaction when appropriately tapered plugger are used.

#### Technique

- 1- After selecting an appropriate master cone, a plugger is prefitted to fit within 5 to 7 mm of the canal length.
- 2- The heat source (ex. System B unit) is set to 200<sup>0</sup>C.
- 3- The plugger is inserted into the canal orifice when the master cone is present in the root canal and activated to remove excess coronal material.
- 4- Compaction is initiated by placing the cold plugger against the gutta-percha in the canal orifice.
- 5- Firm pressure is applied and heat is activated with the device. The plugger is moved rapidly (1 to 2 s) to within 3 mm of the binding point.
- 6- The heat is inactivated while firm pressure is maintained on the plugger for 5 to 10 seconds.
- 7- After the gutta-percha mass has cooled a 1 second application of heat separates the plugger from the gutta-percha, and it is removed.

### Thermoplastic Injection Techniques

Heating of gutta-percha outside the tooth and injecting the material into the canal is an additional variation of the thermoplastic technique. This

technique is used to obturate irregularities difficult to fill by other techniques as internal resorption. The obtura III, Calamus, Ultradent and Guttaflow devices and systems are examples of this type.

Technique:

- 1- Canal preparation is similar to other obturation techniques and the apical foramen should be as small as possible to prevent extrusion of gutta-percha.
- 2- The canal walls are coated with sealer using the master apical file.
- 3- A gutta-percha pellet is preheated in the gun, and the needle is positioned in the canal so that it reaches within 3 to 5 mm of the apical preparation.
- 4- Gutta-percha is then gradually, passively injected by squeezing the trigger of the “gun.”
- 5- The needle backs out of the canal as the apical portion is filled.
- 6- Pluggers dipped in alcohol are used to compact the gutta-percha. Compaction should continue until the gutta-percha cools and solidifies to compensate for the contraction that takes place on cooling.
- 7- Both overextension and under extension are common results.

Carrier-Based Gutta-Percha

Thermafil and Soft Core cones were introduced as a gutta-percha obturation material with a solid core. The technique has a central plastic core which facilitates the adaptation of the  $\alpha$ -phase gutta-percha to the root canal walls apically and laterally.

Advantages included ease of placement and the pliable properties of the gutta-percha.

Technique:

- 1- Size verifiers should fit passively at the corrected working length.
- 2- After drying the canal a light coat of sealer (Grossman sealer) is applied and a carrier is marked, set to the predetermined working length.
- 3- Removal of the smear layer is strongly recommended because it enhances the seal.
- 4- The carrier is disinfected with 5.25% NaOCI for 1 minute and rinsed in 70% alcohol.
- 5- The carrier is then placed in the heating device to the specified temperature.
- 6- When the carrier is heated, it has approximately 10 seconds to be inserted it into the canal. This is accomplished without rotation or twisting.
- 7- The position of the carrier is verified radiographically.
- 8- The gutta-percha is allowed 2 to 4 minutes to cool A before resecting the coronal portion of the carrier.
- 9- Vertical compaction of the coronal gutta-percha can be accomplished.

10- An advantage to this technique is the potential for movement of gutta-percha into lateral and accessory canals but extrusion of material beyond the apical extent of the preparation is a disadvantage.

### Solvent Techniques

Gutta-percha can be plasticized with solvents such as chloroform, eucalyptol, and xylol. A gutta-percha cone is softened and placed into the canal to adapt better to the root canal wall; the mass hardens as the solvent evaporates. Disadvantages of this technique include:

- 1- Shrinkage occurs with the evaporation process causing voids.
- 2- Irritation of periradicular tissues by the solvent.

### Pastes

Pastes have same requirements of the root canal obturating materials. They can adapt to the complex internal canal anatomy; however, the flow characteristic can result in extrusion or incomplete obturation. Some pastes are toxic because they include paraformaldehyde therefore they are not used now.