Endodontics 2019-2020

Lecture 6 Root canal filling materials

Sealers

They are paste like material that is essential to seal the space between the dentinal wall and the gutta-percha.

Functions of the root canal sealer:

1- Cementing the core material to the canal wall.
2- Filling and marking irregularities that cannot be filled by gutta-percha (lateral and accessory canals).
3- Act as a lubricant to ease the placement of the master cone.
4- Act as a bactericidal agent.

Properties of an ideal Sealer:

1- Exhibits tackiness when mixed to provide good adhesion.
2- Produce a hermetic seal.
3- Radiopaque.
4- Very tine powder to get a smooth mix with the liquid.
5- No shrinkage on setting.
6- No staining of tooth structure.
7- Bacteriostatic.
8- Exhibits a slow set.
9- Insoluble in tissue fluids.
10- Tissue tolerant.
11- Soluble in common solvents.

Zinc Oxide and Eugenol:

Zinc oxide-eugenol sealers have been used for many years. They have certain properties as:

1- Exhibit a slow setting time.
2- Shrinkage on setting.
3- Solubility especially when extruded outside the root canal.
4- Stain tooth structure.
5- It has antimicrobial activity.

Types of zinc oxide eugenol sealers:

1- Rickert sealer. This powder/liquid sealer contains silver particles for

radiopacity. It stains tooth structure if not completely removed. This sealer is popular when using thermoplastic techniques.
2- Procosol sealer. It is a modification of rickert's formula in which the silver particles have been removed.
3- Roth's sealer. This is a modification of the Rickert' sealer as it is no staining.
4- Tubli-Seal. It is a catalyst/base zinc oxide-eugenol sealer. It has a faster setting time when compared with the liquid/powder sealers.

Calcium Hydroxide Sealers:-
They were developed for their antimicrobial activity and osteogenic-cementogenic potential. These actions were very limited. From the types of this group are Sealapex (catalyst/base system), Apexit and Apexit Plus.

Noneugenol Seaters:-
They are root canal sealers without the irritating effects of eugenol.

Glass lonomer Seaters:-.
The glass ionomers have been developed in root canal obturation because of their dentin-bonding properties. An example from this group is Ketac-endo.

Properties of this group:
1- It enables adhesion between the material and the canal wall.
2- It is difficult to properly treat the dentinal walls in the apical and middle thirds with modifying agents to receive the glass ionomer sealer.
3- It has minimal antimicrobial activity.

Resin resin sealers.
These sealers provide adhesion, and do not contain eugenol.
Types of this group are:
1- Ah-26. It is a slow-setting epoxy resin that releases formaldehyde when setting.
2- Ah Plus. It is a modified formulation of Ah-26 in which formaldehyde is not released. It exhibits a working time of approximately 4 hours.
3- EndoreZ. It is a methacrylate resin with hydrophilic properties. When used with endoreZ resin-coated gutta-percha cones the dual cure endoreZ sealer bonds to both the canal walls and the core material.
4- Diaket. It is a polyvinyl resin sealer.
5- Epiphany and RealSeal. They were introduced for use with the resilon filling material.

Silicone Sealers.

1- RoekoSeal is a polyvinylsiloxane that is supposed to expand slightly on setting.

2- GuttaFlow is a cold flowable matrix that is triturated. It consists of gutta-percha added to roekoSeal. Sealing ability is comparable to other techniques.

Bioceramic sealers.

It is composed of zirconium oxide, calcium silicates, calcium phosphate monobasic, calcium hydroxide, and various filling and thickening agents.

Properties of this group:

1- It is a hydrophilic sealer it utilizes moisture within the canal to complete the setting reaction.

2- It does not shrink on setting.

3- It is biocompatible.

4- It exhibits antimicrobial properties during the setting reaction.

Semi Rigid types materials for obturation of the root canal

1- Gutta-Percha

Gutta-percha is the most commonly used root canal filling material. It is a linear crystalline polymer that melts at a set temperature, with a random but distinct change in structure resulting. It occurs naturally as 1, 4-polyisoprene and is harder, more brittle, and less elastic than natural rubber. The crystalline phase has two forms, the alpha phase and the beta phase. The alpha form is the material that comes from the natural tree product. The processed, or beta, form is used in gutta-percha for root fillings.

When heated. gutta-percha undergoes phase transitions. The transition from beta phase to alpha phase occurs at around 46° C. An amorphous phase develops at around 54° C to 600 C. When cooled very slowly gutta-percha crystallizes to the alpha phase.

Normal cooling returns the gutta-percha to the beta phase. Gutta- percha cones soften at a temperature above 64° C.

These cones can easily be dissolved in many solvents as chloroform, halothane and xylene. Modern gutta-percha cones that are used for root canal fillings contain only about 20% gutta-percha. The major component is zinc oxide (60% to 75%). The remaining 5% to 10% consists of various resins, waxes, and metal sulfate.

Antiseptic gutta-percha with various antimicrobial agents as chlorhexidine and calcium hydroxide may be seen. Gutta-percha cannot be heat sterilized,

therefore NaOCl can be used to disinfect the cones by dipping them for 1 minute.
Pressure applied during root canal filling procedures does not compress gutta-percha, but rather compacts the gutta-percha cones to obtain a more three- dimensionally complete fill of the root canal system. After heating, while cooling, there is a slight shrinkage of approximately 1% to 2% when the gutta-percha has solidified.
Gutta-percha cannot be used alone as a filling material; it lacks the adherent properties necessary to seal the root canal space. Therefore, a sealer is always needed for the final seal. Gutta-percha cones are available in tapers matching the larger tapered rotary instruments (#.02, #.04, and #.06).

Advantages of gutta-percha
1- Inert
2- Dimensional stability
3- Non allergic
4- Antibacterial
5- Non staining to dentin
6- Radiopaque
7- Compactable
8- Softened by heat
9- Softened by organic solvents

Disadvantages of gutta-percha
1- Lack of rigidity
2- No adherence to dentin
3- No complete adaptation to narrow areas.

2- Resilon
It is a thermoplastic, synthetic, polymer-based root canal filling material. It was developed to create an adhesive bond between the solid-core material and the sealer.
Resilon can be supplied in the same ISO sizes and shapes (cones and pellets) as gutta-percha. When manufactured in cones, Resilon's flexibility is similar to that of gutta-percha. Based on polyester polymers, Resilon contains bioactive glass and radiopaque fillers (bismuth oxychloride and barium sulfate) with a filler content of approximately 65%. It can be softened with heat or dissolved with solvents such as chloroform.

Solid type materials for obturation of the root canal

1- Semi rigid materials as silver cones which are not used now. They are flexible and fill narrow curved root canals. When silver cones contact tissue fluids or saliva, they corrode. The corrosion products are cytotoxic.

2- Rigid materials as Vitalium cones which are inflexible and were used as endodontic implants.