Subject: Dental Material II instructor: Mr . Usman

Final term Assignment 50 Marks

Department AHS DT 4th Semester

# Answer the following questions .

**Q1 .** Explain uses of calcium hydroxide cement

**Q2 .**  Write a detail note on properties of Mineral trioxide aggregate and also explain Manipulation and setting reaction of MTA .

**Q3 .**  Discus manipulation of amalgam write indication and contraindication of amalgam .

**Q4 .**  Discus composition of calcium hydroxide with advantage and disadvantages

**Q5 .**  Write component of composite resin and also discus uses of composite resin .

**Answer No 1**

**Uses of Calcium Hydroxide Cement**

1. **Intracanal Medicament**

It is the most commonly used dressing for treatment of the vital pulp . It also plays a major role as an inter-visit dressing in the disinfection of the root canal system . Calcium hydroxide cannot be categorized as a conventional antiseptic but it kills bacteria in root canal space . Calcium hydroxide is a slowly working antiseptic . Direct contact experiments in vitro require a 24 hour contact period for complete kill of entero-cocci . Calcium hydroxide not only kills bacteria but it also reduces the effect of the remaining cell wall material lipo-polysaccharide . It has a wide range of antimicrobial activity against common endodontic pathogens but is less effective against Enterococcus faecalis and Candida albicans .

1. **Endodontic Sealer**

To be therapeutically effective calcium hydroxide must be dissociated into Ca++ and OH- . Therefore to be effective an endodontic sealer based on calcium hydroxide must dissolve and the solid consequently lose content .

1. **Pulp capping Agent**

Calcium hydroxide is generally accepted as the material of choice for pulp capping . Histologically there is a complete dentinal bridging with healthy radicular pulp under calcium hydroxide dressings . When calcium hydroxide is applied directly to pulp tissue there is necrosis of adjacent pulp tissue and an inflammation of contiguous tissue .

1. **Apexification**

In apexification technique canal is cleaned and disinfected when tooth is free of signs and symptoms of infection the canal is dried and filled with stiff mix of calcium hydroxide and MTA . Histologically there is formation of osteodentin after placement of calcium hydroxide paste . There appears to be a differentiation of adjacent connective tissue cells; there is also deposition of calcified tissue adjacent to the filling material

1. **Pulpotomy**

It is the most recommended pulpotomy medicament for pulpally involved vital young permanent tooth with incomplete apices . A pulpotomy is the removal of a portion of the pulp including the diseased aspect with the intent of maintaining the vitality of the remaining pulpal tissue by means of a therapeutic dressing

1. **Weeping Canals**

For such teeth dry the canals with sterile absorbent paper points and place calcium hydroxide in canal . Calcium hydroxide converts the acidic pH of periapical tissue in the weeping canal to basic pH .

**Answer No 2**

**Properties of Mineral Trioxide Aggregate(MTA)**

1. **Setting Expansion** Set MTA exhibits a low setting expansion of less than 0 . 1% .
2. **Radiopacity** MTA is less radio opaque than IRM amalgam or gutta-percha and has similar radiodensity as Zinc Oxide Eugenol . The mean radiopacity of MTA is 7 . 17 mm of equivalent thickness of aluminium which is sufficient to make it easy to visualize radiographically .
3. **Solubility** Although the set MTA shows no signs of solubility the solubility might increase if more water is used during mixing . The set MTA when exposed to water releases calcium hydroxide is responsible for its cementogenic property .
4. **Marginal Adaptation and Sealing** Ability This property is most vital for any restorative material especially when used for root end filling repair of perforations pulp capping or pulpotomy procedures . Bates et al found MTA superior to the other traditional root-end filling materials . MTA expands during setting which may be the reason for its excellent sealing ability . According to Torabinejad et al MTA seals very superiorly and no gaps were found in any of the experimental specimen . However amalgam Super EBA and IRM exhibited gaps ranging from 3 . 8 to 14 . 9 microns . MTA has also proved itself to be superior in the bacterial leakage test by not allowing the entry of bacteria at the interface . MTA thickness of about 4 mm is sufficient to provide a good seal .
5. **Antibacterial and Antifungal Property** Torabinejad et al reported that MTA shows no antimicrobial activity against any of the anaerobes but have some effect on five the nine facultative bacteria . Since most of the flora in the root canal are strict anaerobic bacteria with few facultative anaerobes MTA may not be beneficial as a direct antibacterial in endodontic practice . However it can be proclaimed as an antibacterial agent only by virtue of providing a good seal and preventing micro leakage .
6. **Reaction with other dental** Materials MTA does not react or interfere with any other restorative material . Glass Ionomer cements or composite resins used as permanent filling material do not affect the setting of MTA when placed over it . Residual calcium hydroxide may interfere with the adaptation of MTA to dentin thereby reducing its sealing ability either by acting as a mechanical obstacle or by chemically reacting with MTA . This may be important when calcium hydroxide is placed in the cavity in between the appointments prior to the placement of MTA .

**Manipulation and Setting Reaction of MTA**

The MTA paste is obtained by mixing 3 parts of powder with 1 part of water to obtain putty like consistency (distilled water) . Mixing can be done on paper or on a glass slab using a plastic or metal spatula . This mix is then placed in the desired location and condensed lightly with a moistened cotton pellet . MTA has a pH of 10 . 2 immediately after mixing and increases to 12 . 5 after 3 hours of setting which is almost similar to calcium hydroxide . MTA powder should be stored carefully in closed sealed containers away from moisture . The mixing time of MTA is crucial . If the mixing of MTA is prolonged it results in dehydration of the mix . Sluyk et al in 1998 reported that the mixing time should be less than 4 minutes . MTA takes longer time to set compared to any other material . The exact time taken to set varies between different studies .

According to Torabinejad and colleagues in 1995 the setting time of grey MTA is about 2 hours and 45 minutes (+5minutes) whereas Islam et al in 2006 reported 2 hours and 55 minutes for grey MTA and 2 hours and 20 minutes for white MTA . Extended setting period of MTA is one of its main drawbacks . It is suggested by many investigators that the incorporation of accelerators such as sodium phosphate dibasic (Na2HPO4) and calcium chloride (CaCl2) may reduce the setting time . MTA being hydrophilic requires moisture to set making absolute dryness contraindicated . Presence of moisture during setting improves the flexural strength of the set cement .

**Answer No 3**

**Manipulation of Amalgum**

**Trituration**

Trituration is the process by which mercury is allowed to react with the alloy powder . This procedure allows the rubbing of the surface oxide on amalgam particles exposing an active surface to react with mercury .

**Trituration**

1. Hand Trituration
2. Mechanical Trituration

**Hand Mixing**

A glass mortar and pestle is used . The mortar has its inner surface roughened to increase the friction between amalgam and glass surface with carborundum paste . A pestle is a glass road with a round end .

**Mechanical Maxing**

The disposable capsule serves as a mortar . Some capsules have a cylindrical metal or plastic piece in the capsule which serves as the pestle . Reusable capsules are available with friction fit or screw . Amalgamators have automatic timer and speed control device . The speed ranges from 3200 to 4400 cycles per minute . High copper alloys require higher mixing speed . Mechanical amalgamator for proportioned capsules (left) Close-up the mechanical arm that grips and vibrates the capsules .

**Condensations**

The amalgam is placed in the cavity after trituration and condensed using suitable instrument . Proper condensation increase the strength and decrease the creep of the amalgam . Condensation must always be done within the four walls and floor . If one or more walls of the cavity are missing a steel matrix may be used to compensate for it .

**Manual Condensation**

The mixed material is condensed in increments . Each increment is carried to the prepared cavity by means of a small forceps or an amalgam carrier . Once inserted it should be condensed immediately with sufficient pressure .

**Mechanical Condensation**

Mechanical condensers provide vibration or impact type of force to pack the amalgam mix . Less effort is needed than for hand condensation .

**Carving**

The amalgam is overfilled into the cavity and the mercury rich surface layer is trimmed away . The filling is carved to reproduce the tooth anatomy . The carving should not be started until the amalgam is hard enough to offer resistance to the carving instrument . A scraping or ringing sound should be heard when it is carved . If the carving is started too soon the amalgam may be so plastic that it may pull away from the margins .

**Burnishing**

After the carving the restoration is smoothened by burnishing the surface and margins of the restoration . Burnishing slow setting alloys can damage the margins of the restoration . Burnishing is done with ball burnisher using light stroke proceeding from the amalgam surface to the tooth surface . Final smoothing can be done by rubbing the surface with a moist cotton pellet .

**Polishing**

Polishing minimizes corroision and prevents adherence of plaque . The polishing should be delayed for atleast 24 hours after condensation .

**Indication and Contraindication of Amalgam**

**Indication of Amalgum**

* Restoration of posterior teeth (Class I & II) (Moderate to large preparations) .
* In some cases restoration distal surface of the canine .
* Class V preparations (some cases) .
* Class VI preparation .
* Core build up for badly broken down teeth in the posterior teeth .

**Contraindication of Amalgum**

* When esthetics is important (e . g . anterior teeth) .
* Patients have a history of allergy to mercury or other amalgam components .
* Remaining tooth structure requires support .
* Treatment of incipient or early primary fissure caries .

**Answer no 4**

**Composition of Calcium Hydroxide**

**Accelerator Paste**

* Alkyl salicylate 36 – 42 % .
* Inert fillers – titanium oxide 12 – 14 % .
* Barium sulphate 32 – 35 % .
* Calcium sulphate 14 – 15 % .

**Base Paste**

* Calcium hydroxide 50-60% .
* Zinc oxide 10% .
* Zinc stearate 0 . 5% .
* Ethylene toluene sulphonamides and paraffin oil 39 . 5% .

**Advantage**

* Initially bactericidal then bacteriostatic .
* Promotes healing and repair .
* High pH stimulates fibroblasts
* Neutralizes low pH of acids .
* Stops internal resorption .
* Inexpensive and easy to use .

**Disadvantage**

* Does not exclusively stimulate dentinogenesis .
* Does exclusively stimulate reparativedentin .
* Associated with primary tooth resorption .
* May degrade during acid etching .
* Degrades upon tooth flexure .
* Marginal failure with amalgam condensation .
* Does not adhere to dentin or resin restoration .

**Answer No 5**

**Component of Composit Resin**

* Matrix .
* Filler .
* Coupling Agent .
* Initiators and accelerators .
* Pigments .

**Special Use Composite Materials**

* Flowable
* Condensable / Packable

**Flowable Composites**

* Has a reduced filler content to make the material “flowable”
* Indicated for Class I restorations in the gingival areas
* Used as a cavity base or liner especially for Class II preparations wherein access is difficult to achieve
* Used as a pit and fissure sealant

**Condensable Composite**

* Has a filler particle that inhibits the filler particles by sliding to one another .
* Stiffer, thicker feel .
* For Class I restorations in the gingival areas .
* Used as a cavity base or liner especially for Class II preparations wherein access is difficult to achieve .
* Used as a pit and fissure sealant .