RESTORATIVE MATERIALS USED ON PEDIATRIC DENTISTRY .. (2)

GLASS IONOMER CEMENTS

Glass ionomer cements (GICs) were developed in an attempt to capitalize on the favorable properties of both silicate and polycarboxylate cements. Unfortunately, the first generation materials had severe limitations. Excessive opacity, limited shade selection, mixing and handling problems, quickly doused the enthusiasm surrounding this new product. As a result, it has struggled to gain popularity, even though continued research has produced a clinically useful restorative materials.

Properties of Glass Ionomer Cement

- *Low solubility*
- *Coefficiant of thermal expansion similar to dentin*
- *Fluoride release and fluoride recharge*
- *High compressive strengths*
- *Bonds to tooth structure by primarily chemical, micromechanical way.*
- *Low flexural strength and shear strength*
- *Dimensional change (shrinks on setting, expands with water sorption)*
- *Brittle*
- *Lacks translucency*
- *Rough surface texture*
- *Biocompatible to tissues.*

Indications

- *Non-stress bearing areas*
- *Class III and V restorations in adults*
- *Class I and small cl II restorations in primary dentition*
- *Temporary or "caries control" restorations*
- *Crown margin repairs*
- *Cement base under amalgam, resin, ceramics, direct and indirect gold*
- *Core build-ups when at least 3 walls of tooth are remaining after crown preparation.*

Contraindications

- *High stress applications*
- *Class IV and class II restorations*
- *Cusp replacement*
- *Core build-ups with less than 3 sound walls remaining.*

Advantages

- *Bonds to enamel and dentin*
- *Significant fluoride release, can be recharged*
- *Coefficient of thermal expansion similar to tooth structure*

• Tooth colored
• Low thermal conductivity.

Disadvantages

• Opacity higher than resin
• Less polishability than resin
• Poor wear resistance
• Brittle, poor tensile strength
• Poor longevity in xerostomic patients.

Recent Developments of Glass Ionomer Cement

• Modified powder — liquid system

– This system has improved wetting of the powder by the liquid rendering the mixing process much easier and faster.

• Capsules

– The glass ionomer cement in the form of capsule system is a modern application method, which simplifies and allows procedures to be performed with greater ease and efficiency.
– These capsules contain premeasured glass ionomer powder and liquid, which ensures correct ratio, consistency of mix and a predictable result.
– These capsules have angled nozzles that act as a syringe for accurate placement of the material into a cavity or a crown for cementation.

• Paste-paste dispensing system

– This is the latest development in the glass ionomer cement technology. This dispensing system was designed with the objectives of providing optimum ratio, easy mixing, easy placement, total reliability, using a specially designed cartridge and an easy-to-use material dispenser.
– In order to provide the material in a paste–paste consistency, an ultra fine glass powder was designed specifically. The low particle size provides the mixed cement with a thixotropic creamy consistency.

Modifications of Glass Ionomer Cement

• Metal modified glass ionomer

- Silver alloy admix (silver amalgam alloy particles mixed with glass particles). The addition of metal powders or fibers to glass ionomer cements can improve strength; however, their esthetics are poor and they do not burnish.
- Cermet (glass sintered with silver): Cermet–ionomer cements have greatly improved resistance to abrasion when compared with glass ionomer cements and their flexural strength is also higher; however, their strength is still insufficient to replace amalgam alloys and their use should be confined to low stress-bearing cavity preparations.

• Resin modified glass ionomer

Resin modification of glass ionomer cement was designed to produce favorable physical properties similar to those of resin composites while maintaining the basic features of the conventional glass ionomer cement.

- In their simplest form, these are GICs with the addition of a small quantity of a resin in the liquid.

• "High strength," "packable," or "high viscosity" glass Ionomers

– These glass ionomers are particularly useful for atraumatic restorative treatment technique (ART). They were designed as an alternative to amalgam for posterior preventive restorations. These cements set only by a conventional neutralization reaction but have properties that exceed those of the resin modified systems. Setting is rapid, early moisture sensitivity is considerably reduced and solubility in oral fluids is very low.

CALCIUM HYDROXIDE

Calcium hydroxide was introduced in United States by Teuscher and Zander in 1938, and is since then being used as a pulpal medicament. Although the overall mechanisms of action of calcium hydroxide are not fully understood, many articles have been published describing its biological properties, role of the high pH and the ionic activity in the healing process, diffusion through dentinal tubules and influence on apical microleakage.

Uses of Calcium Hydroxide

• Calcium hydroxide as an intracanal medicament:

– It is the most commonly used dressing for treatment of the vital pulp.

– It also plays a major role as an intervisit dressing in the disinfection of the root canal system.

• Calcium hydroxide as an endodontic sealer

– In the root canal obturation, sealer plays an important role, as it fills the gap between the walls of the prepared dentine and the gutta-percha.

Examples of calcium hydroxide sealers: Sealapex (Kerr), Apexkit (Vivadent).

• Calcium hydroxide as a pulp capping agent

– Calcium hydroxide is generally accepted as the material of choice for pulp capping.

– When calcium hydroxide is applied directly to pulp tissue there is necrosis of adjacent pulp tissue and an inflammation of contiguous tissue. Dentinal bridge formation occurs at the junction of necrotic tissue and vital inflamed tissue.

– Three main calcium hydroxide products for pulp capping are Pulpadent, Dycal, Hydrex (MPC).

• Calcium hydroxide in apexification

– Apexification technique is recommended in nonvital young permanent tooth with incomplete apices; it is cleaned and disinfected, then if tooth is free of signs and symptoms of infection, the canal is dried and filled with stiff mix of calcium hydroxide.

– Commercial paste of calcium hydroxide like Calasept, Pulpdent, Metapex may be used to fill the canals.

• Calcium hydroxide in pulpotomy

– It is the most recommended pulpotomy medicament for pulpally involved vital young permanent tooth with incomplete apices.

– It is acceptable because it promoted reparative dentin bridge formation and thus pulp vitality is maintained.

• Calcium hydroxide in weeping canals

– Sometimes a tooth undergoing root canal treatment shows constant clear or reddish exudate associated with periapical radiolucency. Tooth can be asymptomatic or tender on percussion, exudates stops but when opened in next appointment, it again reappears, this is known as "weeping canal".

– In these cases tooth with exudates is not ready for obturation. Since culture reports normally show negative bacterial growth, so antibiotics are of no help. For such teeth, dry the canals with sterile absorbent paper points and place calcium hydroxide in canal which helps in controlling the exudates because pH of periapical tissues is acidic in weeping stage which gets converted into basic pH by calcium hydroxide.

Advantages of calcium hydroxide

- *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*

Disadvantages of calcium Hydroxide

- *Associated with primary tooth resorption*
- *Dissolve after one year*
- *May degrade during acid etching*
- *Degrades upon tooth flexure*
- *Marginal failure with amalgam condensation*

- *Does not adhere to dentin or resin restoration*

MATRIX

Matricing is a procedure where by a temporary wall is created in the areas of tooth structure lost during preparation. The appliance used for building these walls is called ***matrix****.*

Rationale for Using Matrix

- *Accurate reproduction of contour of teeth*
- *To prevent interproximal excess*
- *To establish tight contact areas*
- *To maintain integrity of normal gingival papillae*
- *To maintain arch dimensions in primary dentition.*

Functions of Matrix

- *To replace the missing wall*
- *Close adaptation of restorative material*
- *Retain restorative material during placement*
- *Allows restoration of contact point and external crown contour*
- *Isolation of cavity.*

Ideal Requirements of Matrix

- *Rigid to allow condensation*
- *Promote desired contour*
- *Should form positive contact with tooth*
- *Should be of minimal thickness*
- *Compatible with restorative material*
- *Ease of application*
- *Economic.*

Classification of Matrix

❖ *According to place of application*

- *Posterior – T-band, Toffelmire*
- *Anterior – Celluloid matrix*

❖ *According to constituents*

- *Metallic – Ivory no.1, Ivory No. 8, Toffelmire*
- *Nonmetallic – Mylar strips*

❖ *According to presence or absence of retainer*

- *With retainer - Ivory No. 1, Ivory No. 8*
- *Without retainer – S-band*

❖ *According to form*

- *Anatomical – Celluloid crown form*
- *Non-anatomical – Ivory No. 1*

❖ *According to patency*

- *Patent – Ivory No. 1*
- *Nonpatent – Celluloid crown form*

❖ *According to use*

- *Universal – Ivory No. 8, Toffelmire*
- *Unilateral – Ivory No. 1*

Recent Modifications in Matrix

- *Sectional matrix: This system is easy to place, gives a large preparation area thus reducing the working time. An added advantage of this system is that both mesial and distal proximal restorations can be accomplished by one matrix placement.*
- *Smart view matrix system: The Smart View Matrix System also comes with Smart Bands Sectional Matrices and titanium instruments. The Smart Bands have a nonstick surface, are anatomically contoured, and integrate a reinforced placement tab while the instruments are made of high-grade, blue titanium. The specially designed titanium instruments are strong, durable, and lightweight. These are mostly used for composite restorations.*