Resin Modified Glass Ionomer (RMGI)

- It is a glass ionomer cement in which the acid base setting reaction has been supplemented by a polymerization reaction of added resin.
Conventional GI chemistry combined with resin technology » creation of RMGI

They contain:

- Ion-leachable fluorooaluminosilicate glass in the powder
- Liquid: Monomers (HEMA), polymeric carboxylic acid, water
- Photoinitiator, Chomphorquinone
There are two forms:

1. **Dual Cured:** Contains a water-HEMA mixture
   - **Slow acid-base** setting reaction
   - **Photoinitiated reaction** occurs faster through homopolymerization and copolymerization of methacrylate groups grafted on the polyacrylic acid chain and methacrylate groups of HEMA

2. **Tri Cured:** Contains modified polyacids with methacrylate side chains which can be light polymerized. Chemically initiated reaction occurs
   - No or little water is present
<table>
<thead>
<tr>
<th>Material</th>
<th>Manufacturer</th>
<th>Setting mechanism</th>
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</thead>
<tbody>
<tr>
<td>Fuji II LC</td>
<td>GC</td>
<td>Visible light, Acid-base, Chemical</td>
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<tr>
<td>Geristore</td>
<td>Den-Mat</td>
<td>Acid-base, visible light</td>
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<tr>
<td>Ionosit</td>
<td>DMG</td>
<td>Acid-base, visible light</td>
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<tr>
<td>Photac-fil</td>
<td>ESPE</td>
<td>Acid-base, visible light</td>
</tr>
<tr>
<td>Vitremer, Vitrebond</td>
<td>3M</td>
<td>Visible light, Acid-base, Chemical</td>
</tr>
</tbody>
</table>
RMGI
## RMGI-Advantages

### Compared to Conventional Glass Ionomer

<table>
<thead>
<tr>
<th>Feature</th>
<th>Advantage</th>
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<td>Handling</td>
<td><strong>Easier</strong> to handle</td>
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<tr>
<td>Working Time</td>
<td><strong>Longer</strong> working time (Light polymerization)</td>
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<tr>
<td>Mechanical Properties</td>
<td><strong>Improved</strong> compressive, tensile &amp; flexural strengths</td>
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<td></td>
<td>Fatigue, wear resistance</td>
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<td>Fracture toughness</td>
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<td>Bond strengths to enamel &amp; dentin</td>
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<td>Marginal adaptation, microleakage</td>
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<tr>
<td>Water Sensitivity</td>
<td><strong>Less sensitive</strong> to water (Early development of strength &amp; resistance against aqueous attack)</td>
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<td></td>
<td>Light polymerization</td>
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<tr>
<td>Fluoride Release</td>
<td><strong>Equal/higher &amp; rechargeable</strong></td>
</tr>
<tr>
<td>Esthetics, Smoothness</td>
<td><strong>Improved</strong> esthetics &amp; smoothness</td>
</tr>
</tbody>
</table>
RMGI-Uses

• Clinically:
  – Luting agents
  – Cavity liner or base
  – Core build-up material
  – Direct restorative material
  – Pit and fissure sealant
  – Provisional restorative material
  – Retention of orthodontic brackets
  – Retrograde root filling material
RMGI- Direct Restorative Material

• Clinical handling:
  – Hand mixed (powder/liquid)
  – Mechanically triturated (Capsulated)
RMGI-Direct Restorative Material

- Etch the cavity preparation with polyacrylic acid for 10 seconds
- Rinse thoroughly for 10 seconds
- Keep the tooth hydrated
- Mix RMGI, inject into cavity, incremental technique
- Light cure for 20-30 seconds
RMGI- Direct Restorative Material

• Contoured & polished immediately after polymerization
  – Diamond, carbide finishing burs
  – No. 12 blade
  – Polishing with disks, impregnated rubber points or cups and polishing pastes

• Placement of unfilled resin after polishing (Protective coating)
RMGI- Class V
RMGI- Sandwich Technique

• It’s replacing the lost dentin with CGI or RMGI and the enamel with a resin composite

• Combines the **fluoride release** of CGI or RMGI and **excellent esthetics** of composite resin

• Used in class V, class II or class III restorations
RMGI-Sandwich Technique

• **Advantages:**
  1. Lessen polymerization shrinkage of resin composite by lessening the bulk of the material
  2. Fluoride release reduces the chances of recurrent caries
  3. Better seal at dentin or cementum margins
  4. Improves physical and esthetic characteristics

• **Disadvantages:**
  – Two-step procedure
RMGI-Sandwich Technique

- **Open Sandwich:** The CGI or RMGI is carried to the gingival margin if it is on dentin or cementum. The enamel margins are etched and the restoration is completed with a dentin adhesive and composite.

- **Closed Sandwich:** The dentin is covered with CGI or RMGI then entirely veneered with composite.
RMGI-Sandwich Technique

Closed Sandwich Technique

Open Sandwich Technique
Closed Sandwich Technique in class II restorations
Closed Sandwich Technique in class II restorations
Closed Sandwich Technique in class II restorations
Open Sandwich Technique in class II restorations
Open Sandwich Technique in class II restorations
Open Sandwich Technique in class II restorations
Sandwich Technique

The depth of the premolar lesion has approached the cemento-enamel junction.
Sandwich Technique

37 % Polyacrylic acid

RMGI is placed gingivally. After polymerization, the entire cavity is etched with phosphoric acid.
Sandwich Technique

Application of adhesive agent

First increment of composite
Final occlusal increment

Excess composite along the axial margins is removed with finishing disks. The disks are inserted laterally into the proximal space and are used to cut back the excess marginal height.
Sandwich Technique

The tip of an Enhance polishing point is used to reduce the marginal ridge.

Completed RMGIC sandwich restoration on the premolar.
Sandwich Technique

Completed restorations display the appropriate physiological contours

Postoperative view of the restorations 26 months later
RMGI- Base and Liner

- **Examples:**
  - Vitrebond
  - Fuji Lining LC
  - Fuji II LC

- **Advantages:**
  1. Quick setting
  2. Re-mineralization effect
  3. Low modulus of elasticity, works as a stress reliever compensating for the polymerization shrinkage of the composite resin.
Polyacids Modified Resin Composite (Compomer)

• Designed to combine the esthetics of resin composites and fluoride release and adhesion of GIC

• Examples:
  – Dyract, Dentsply
  – Compoglass, Vivadent
PAMRC (Compomers)-Setting Reaction

• Light initiated

• They contain:
  – Alumino-silicate glass
  – Bisglycidyl ether dimethacrylate (bisGMA), Urethane dimethacrylate (UDMA), Triethylene glycol dimethacrylate (TEGDMA)
  – Carboxyl groups attached to the resin backbone of the composite
  – Photoinitiator, Chomphorquinone
PAMRC (Compomers)-Setting Reaction

- Do **not** contain water
- Do **not** set in the dark
- Designed to absorb water to promote a secondary neutralization reaction (allow GI setting reaction to proceed, acid-base reaction)
- Packaged in airtight foil packs to prevent ingress of water vapor
PAMRC (Compomers)

- Considered to be **hydrophobic**

- Lack the ability to bond to the tooth structure, therefore it should be used with a bonding agent for proper adhesion.
PAMRC (Compomers)

**Advantages:**
- Single paste packaging
- Ease of handling
- Esthetic

**Disadvantages:**
- Less fluoride release
- No fluoride uptake
- Does not chemically bond to the tooth structure
PAMRC (Compomers)-Uses

- Clinically:
  - Class I
  - Class II
  - Class V
  - Fissure sealants
  - Retention of orthodontic brackets
• Same as conventional composite restorations:
  – Acid etching procedure
  – Adhesive bonding
  – Incremental placement
  – Light cured for 40 seconds
  – Finishing and polishing procedures
Thank You!

Any Questions?