

213 RDS

Resin Modified Glass Ionomers and Compomers

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Outline

- Resin Modified Glass Ionomer (RMGI)
- Polyacid-Modified Resin Composites (PAMRC)/Compomers
- Sandwich Technique

Conventional Glass Ionomer (CGI)

- They contain:
 - **Glass:** Aluminum, fluoride, calcium, sodium and silica
 - **Liquid:** Polyacrylic acid, polymers, copolymers
- Setting reaction:
 - **Acid-base** reaction between the **glass powder** and the **polyacid liquid**

Conventional Glass Ionomer (CGI)

- Advantages:
 - Long term release of fluoride
 - Inherent adhesion to the tooth structure
 - Good marginal seal, little microleakage
 - High retention rate
 - Esthetic potential

Conventional Glass Ionomer (CGI)

- Disadvantages:
 - Technically demanding
 - Highly sensitive to changes in water content
 - Short working time, but long setting time delaying finishing procedures
 - Physical and esthetic properties inferior to composites

Resin Modified Glass Ionomer

- Setting Reaction
- Advantages
- Uses
- Clinical Handling

RMGI-Setting Reaction

- Conventional **GI** chemistry combined with **resin** technology » creation of **RMGI**
- Dual-cured
- They contain:
 - Ion-leachable **fluoroaluminosilicate** glass in the powder
 - Monomers (**HEMA**)
 - Photoinitiator, **Chomphorquinone**
 - Aqueous **polyacid liquid**

RMGI-Setting Reaction

- There are two forms:
 1. Simple Form: 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. Complex Form: Contains modified polyacids with methacrylate side chains which can be light polymerized
 - No or little water is present

RMGI-Setting Reaction

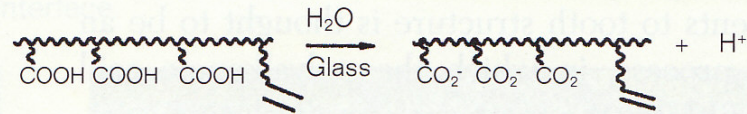
- A true RMGI can be defined as:

A two part system characterized by an **acid-base reaction** critical to its cure, **diffusion based adhesion** between the tooth surface and the cement, and continuing **fluoride release**.

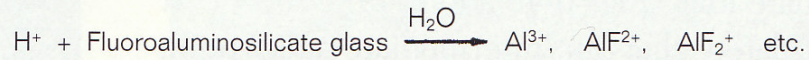
RMGI-Setting Reaction

- The mechanism of adhesion to the tooth structure is an **ion exchange process**.
- The **Polyalkenoic acid** softens and infiltrates the tooth surface, **displacing calcium** and **phosphate** ions.

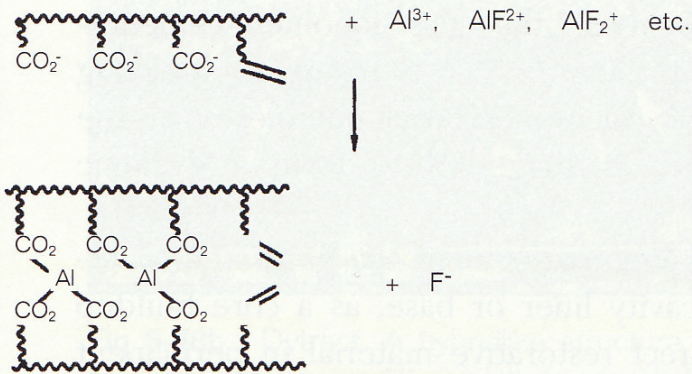
RMGI-Setting Reaction



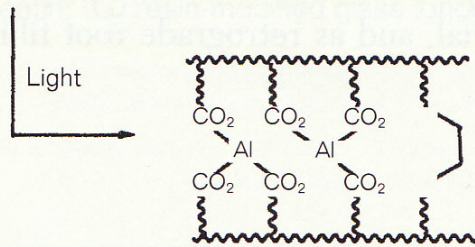
Step 2



Step 3



Step 4



RMGI-Advantages

Compared to Conventional Glass Ionomer

Handling

Easier to handle

Working Time

Longer working time (Light polymerization)

Mechanical Properties

Improved compressive, tensile & flexural strengths

Fatigue, wear resistance

Fracture toughness

Bond strengths to enamel & dentin

Marginal adaptation, microleakage

Water Sensitivity

Less sensitive to water (Early development of strength & resistance against aqueous attack)

Light polymerization

Fluoride Release

Equal/higher & rechargeable

Esthetics, Smoothness

Improved esthetics & smoothness

RMGI

Physical properties of RMGI are still inferior to those of resin composites

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

Material	Manufacturer	Setting mechanism
Fuji II LC	GC	Visible light, Acid-base, Chemical
Geristore	Den-Mat	Acid-base, visible light
Ionosit	DMG	Acid-base, visible light
Photac-fil	ESPE	Acid-base, visible light
Vitremer, Vitrebond	3M	Visible light, Acid-base, Chemical

RMGI- Clinical handling

- Hand mixed (**powder/liquid**) or mechanically triturated (**Capsulated**)
- May be place in bulk – Dual characteristics
- Acid conditioner
- Dentin adhesive system

RMGI- Clinical handling

- 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

PAMRC (Compomers)-Setting Reaction

- Setting Reaction
- Uses
- Clinical Handling

PAMRC (Compomers)-Setting Reaction

- Designed to combine the esthetics of resin composites and fluoride release and adhesion of GIC
- 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)-Setting Reaction

- Considered to be **hydrophobic**
- Lack the ability to bond to the tooth structure
- Significantly lower fluoride release compared to GI
- Examples:
 - Dyract, Dentsply
 - Compoglass, Vivadent

PAMRC (Compomers)-Uses

- Clinically:
 - Class I
 - Class II
 - Class V
 - Fissure sealants
 - Retention of orthodontic brackets

PAMRC (Compomers)-Clinical Handling

- Same as conventional composite restorations:
 - Acid etching procedure
 - Adhesive bonding
 - Finishing and polishing procedures

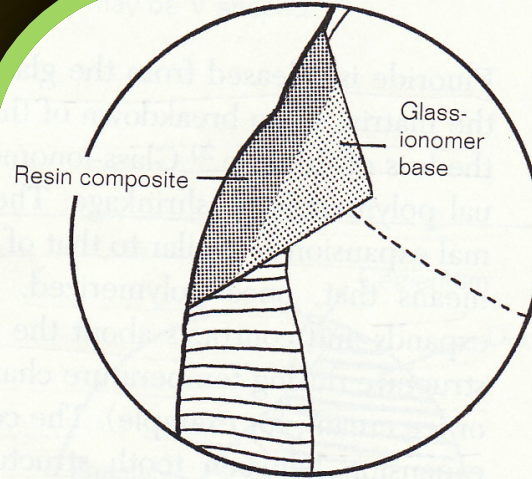
Sandwich Technique

- Used in class V, class II or class III restorations
- Combines the **fluoride release** of CGI or RMGI and **excellent esthetics** of composite resin
- **Advantages:**
 - Lessen polymerization shrinkage of resin composite by lessening the bulk of the material
 - Fluoride release reduces the chances of recurrent caries
 - Better seal at dentin or cementum margins

Sandwich Technique

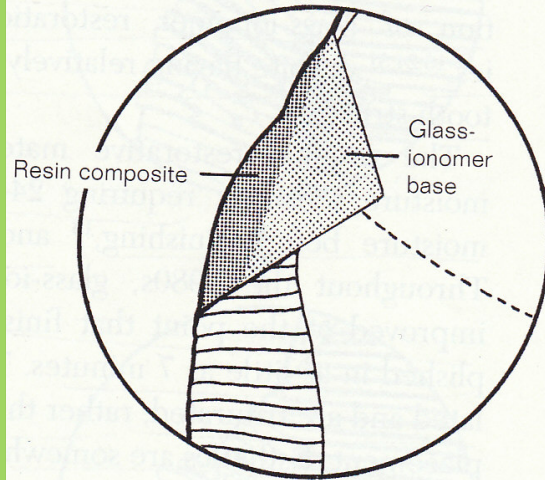
- **Open Sandwich:** The CGI or RMGI is carried to the gingival margin if it is on dentin or cementum. The enamel margins are etched and the restoration is completed with a dentin adhesive and composite
- **Closed Sandwich:** The dentin is covered with CGI or RMGI then entirely veneered with composite

Sandwich Technique



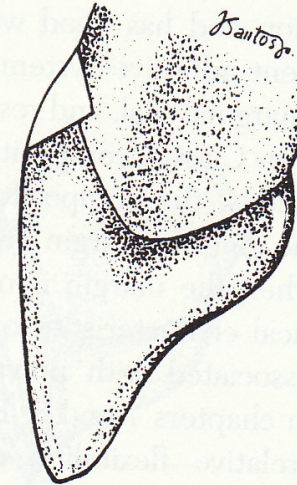
Closed Sandwich Technique

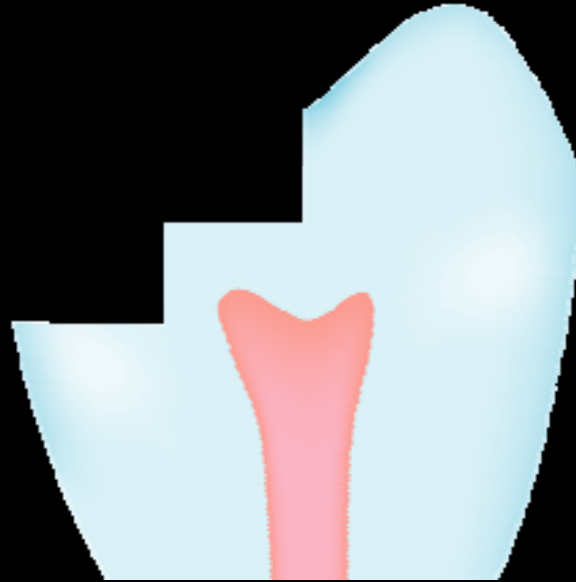
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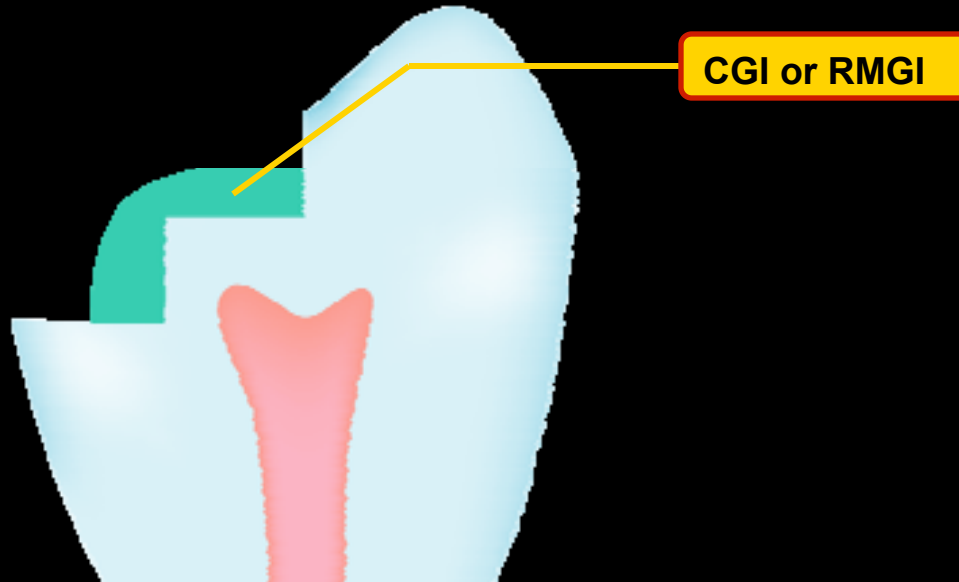
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Open Sandwich Technique

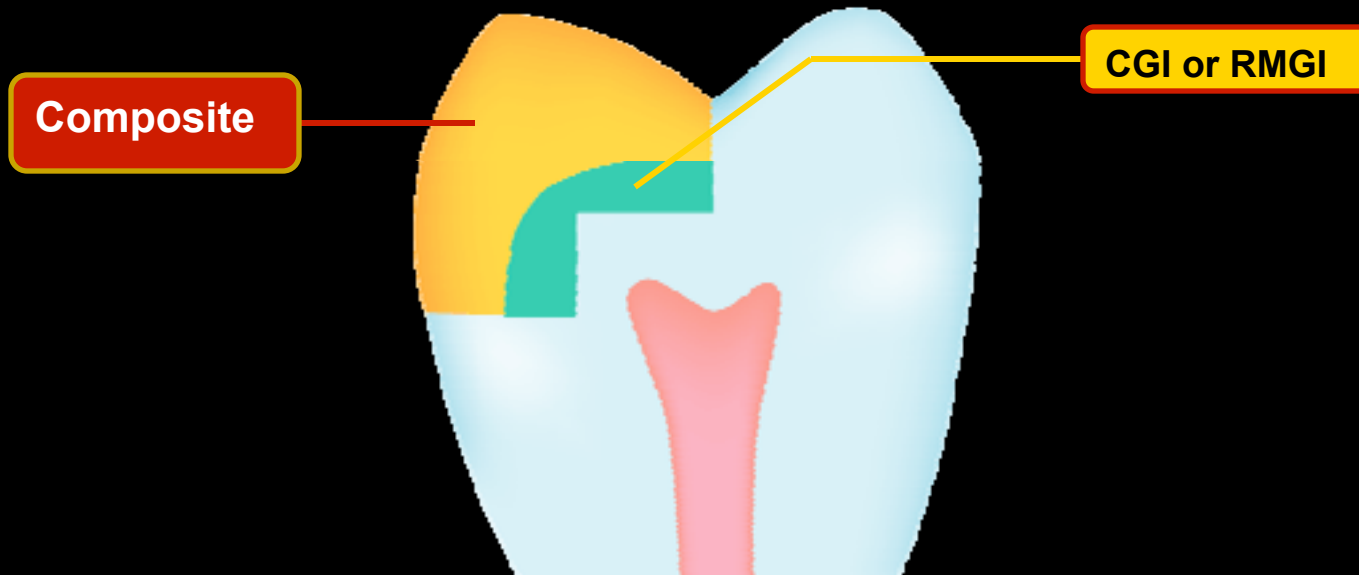




Closed Sandwich Technique in class II restorations



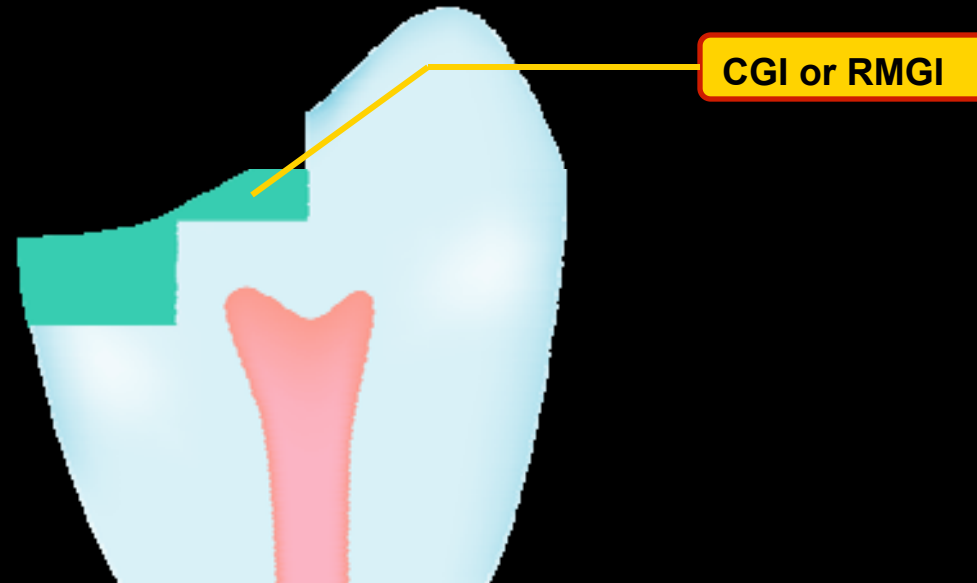
Closed Sandwich Technique in class II restorations



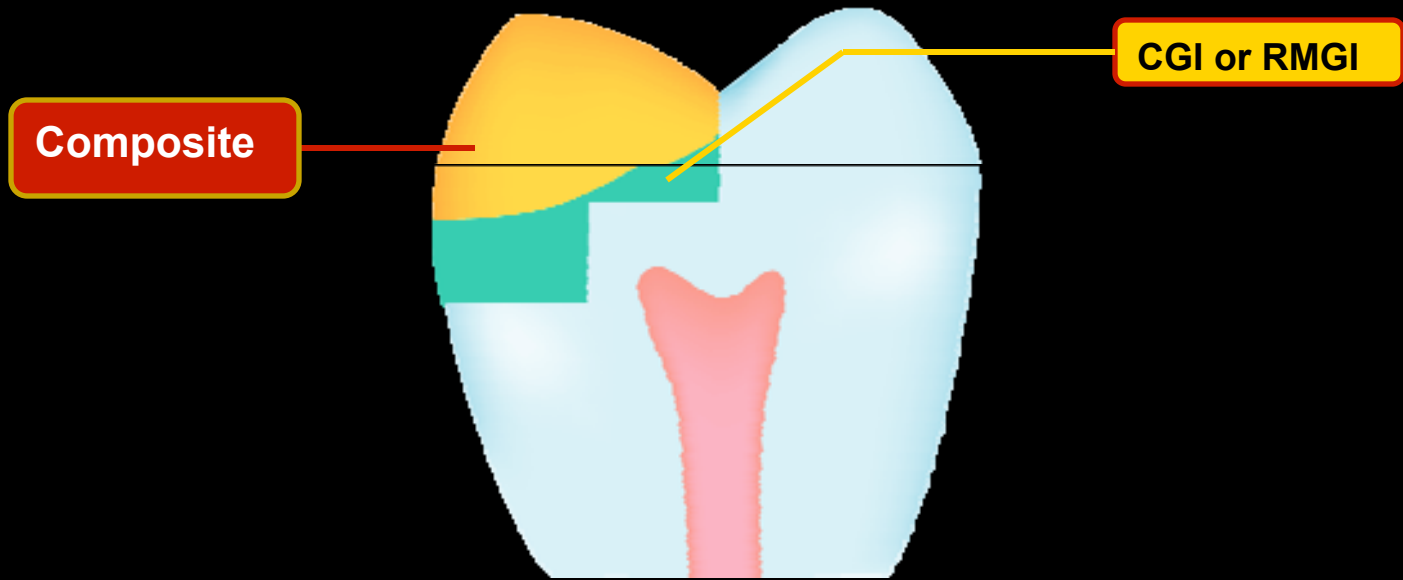
Closed Sandwich Technique in class II restorations



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

Sandwich Technique



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



Thank You!

Any Questions?