

RADY FACULTY OF HEALTH SCIENCES

Liners, Bases, and Temporary Restorations

Restorative Techniques for Dental Hygienists

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Objectives

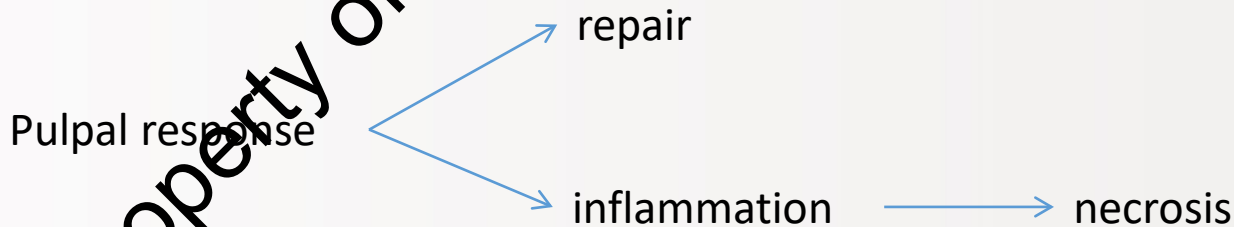
- Following completion of this session participants will be able to:
 - Describe the purpose of pulpal protection
 - Describe the use and clinical application of liners
 - Describe the materials commonly used as liners
 - Describe the use and clinical application of bases
 - Describe the materials commonly used as bases
 - List when a temporary restoration is advisable
 - List when a temporary restoration is not advised
 - Describe the term “caries control”
 - Describe the materials commonly used as temporary restorations

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Purpose of Pulpal Protection

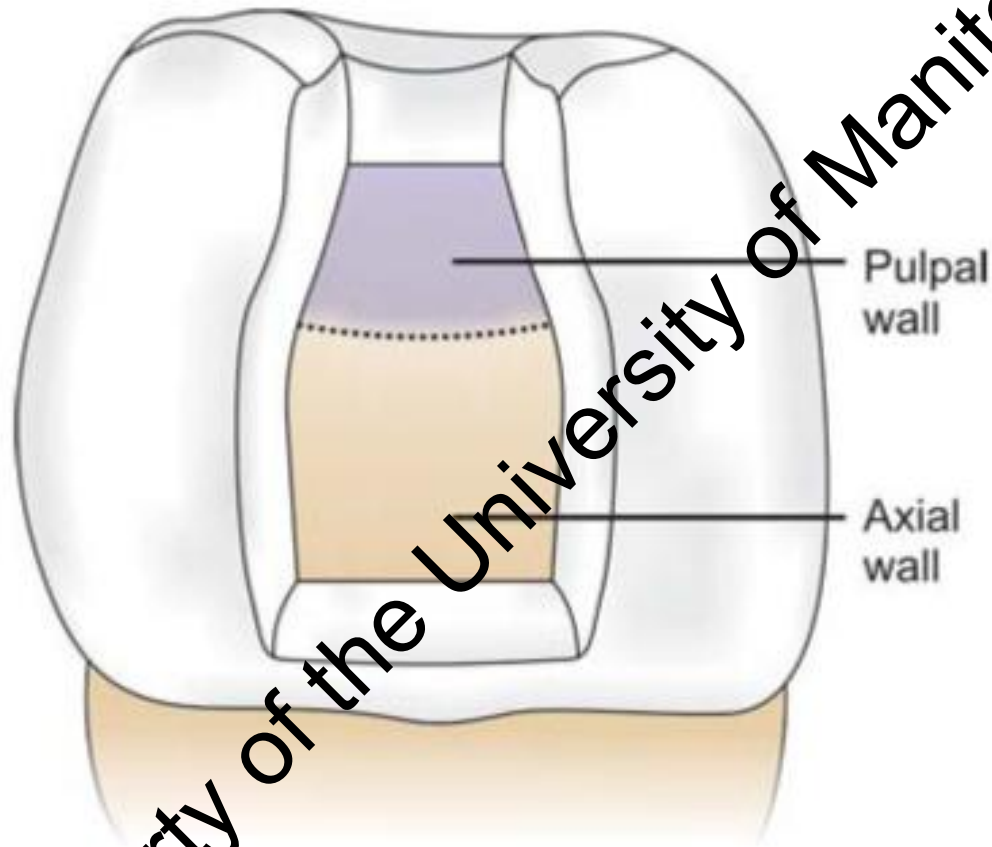
- To protect pulp vitality from:
 - **Chemical stimuli:** From the carious process, restorative materials, and microleakage
 - **Thermal stimuli:** From large metallic restorations, tooth preparation, and polishing the restoration
 - **Mechanical stimuli:** From caries removal and pulpal exposure during preparation of the cavity



Liners and Bases

- A group of *intermediary* materials that are placed between dentin (and sometimes the pulp) and the restorative material
- Applied to the pulpal and axial walls to:
 - Promote pulpal healing and repair (i.e. stimulate a pulpal response)
 - Prevent pulpal irritation (i.e. protect the pulp)
- The choice of material depends on the required function and operator preference

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Linears



Liners

- Provide a barrier to irritants like sealers but also have a therapeutic effect:
 - Fluoride release – GI's
 - Antibacterial effect – GI's CaOH_2
 - Stimulate the formation of reparative dentin - CaOH_2
 - Adhesion to tooth structure – Resin Bonding Agents
- Minimal thickness less than 0.5mm
- Apply with Dycal applicator

Liners – CaOH₂

- Accelerates formation of reparative dentin (tertiary dentin)
- Aqueous based (Dycal® - chemical cure) or Resin based (VLC Dycal® - light cure)
- Placed in areas where dentin is less than 0.5mm – 1mm after caries removal
- Limited indication: direct pulp capping

Linners – CaOH₂

- Dycal®

- Soluble
- Poor compressive strength
- Better Ca release + production of tertiary dentin

- VLC Dycal®

- Less soluble
- Better compressive strength
- Less effective Ca release + production of tertiary dentin



Liners – Glass Ionomer (RMGI)

- Close to ideal liner or base
- Major advantage: chelates to calcified tissue, thus producing an excellent seal against microleakage
- Universal use under both amalgam and composite
- Acceptable compressive strength
- Releases fluoride
- Bonds to dentin
- Brands:
 - Vitrebond®
 - GC lining® cement
- Apply with Dycal applicator



www.moderndentalnetwork.com

Base

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Bases

- Used to fill the deeper parts of extensive preparations
- Serve as a dentin replacement material to:
 - Allow less bulk of definitive restorative material
 - Block out undercuts in an inlay, onlay or crown prep
- Main function: thermal insulation
- Must possess adequate strength to support restoration

- Thickness: max 2mm
- Must not contaminate the margins of a restoration
 - Soluble in oral fluids; would eventually leach out leaving an open margin.... Recurrent decay, weak bond
- Types of cements used for bases:
 - GI
 - Reinforced ZOE (ZOER)
 - Zinc Phosphate
 - Polycarboxylate

Bases - GI (or RMGI)

- Close to ideal liner or base
- Universal use under both amalgam and composite
- Acceptable compressive strength
- Releases fluoride
- Adhesive to dentin
- Examples:
 - Vitrebond®
 - CG lining® cement
 - Ketac-bond®

Heymann, Harold, Edward Swift, Andre Ritter. *Sturdevant's Art and Science of Operative Dentistry, 6th Edition*. Mosby, 2013. VitalBook file.



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Modern Products and Practices

- Some of the newer products can be used as a thin layer as a liner but can also be built up to serve as a base
 - Many bond to dentin and therefore provide a much better seal than unbonded liners and bases
 - Most are light or chemical cured
 - Example: Vitrebond (GIC)
 - Glass Ionomer Cements bond well to dental tissues and can be used as a liner, a base and as a final restoration

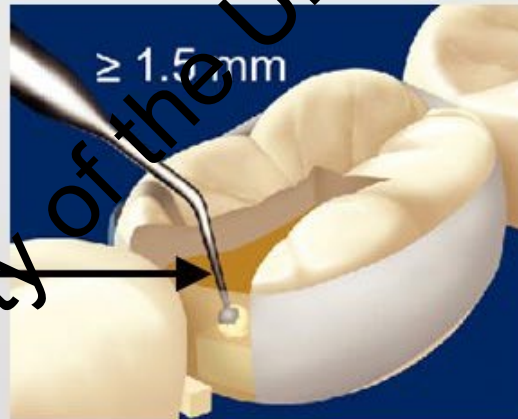




Example of resin-modified glass-ionomer liner (3M Vitrebond Plus)



Use clean
Dycal carrier



Heymann, Harold, Edward Swift, Andre Ritter. *Sturdevant's Art and Science of Operative Dentistry, 6th Edition*. Mosby, 2013. VitalBook file.



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Base – Zinc Oxide Eugenol (ZOE)

- Non-irritating to pulp (sedative)
- Low compressive strength
- Does not bond to tooth structure
- Cannot be placed under composite restorations
- Stimulates tertiary dentin formation
- IRM (Intermediary Restorative Material) (ZOER)



Temporary Restorations

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Temporary Restorations

- May be placed in either primary or permanent teeth as a preventative measure when:
 - Access to a permanent restoration is not immediate or practical
 - There is a reasonable risk of further damage to the tooth structure
 - The pulp is not exposed
 - The client is in discomfort due to recent trauma, fracture, or lost dental restoration
 - The client has not received and medical/dental advice that would contraindicate placing a temporary restoration
 - The client consents to the treatment and it is in the client's best interest to proceed
 - There are no contraindications to the restorative material

Heymann, Harold, Edward Swift, Andre Ritter. *Sturdevant's Art and Science of Operative Dentistry, 6th Edition*. Mosby, 2013. VitalBook file.



Temporary Restorations – Contraindications:

- In situations where professional judgement indicates the need for local anesthesia
- The client has received medical/dental advice that would contraindicate placing a temporary restoration
- On a tooth which requires removal of tooth structure for proper placement of the GIC (may be a good candidate for ART) or a tooth with signs of pulpal exposure
- Teeth with acute or chronic abscesses
- Inadequate tooth structure to retain the GIC



Temporary Restorations – Caries Control

- **Caries Control:** placing a ZOE type cement when the cavity has not had all the carious dentin removed
- Performed to:
 - Protect the pulp from the advancement of the carious process
 - Allow the pulp to form reparative dentin
 - Protect the person from pain
 - As a diagnostic procedure
 - Example: when the clinician is unsure whether or not the pulp is necrotic



Temporary Restorations – Caries Control (IRM)

- Intermediate Restorative Material (IRM)
- Intended to remain in place for up to 1 year
- Provides sedative like qualities on hypersensitive pulp
- Available in powder, liquid or capsule deliveries



Temporary Restorations – Caries Control (IRM)

Placement Technique:

- Place matrix for Class II preparation
- Mix powder and liquid according to manufacturers instructions (1:1) on a glass slab
- Confirm appropriate consistency using your finger
 - Should feel similar to playdough (slightly tacky but not goopey)
- Roll material into a “hotdog” shape; then cut into small pieces using a spatula
- Place small pieces of IRM in preparation using a dycal applicator or small condenser
- Gently compress each layer using a condenser ensuring there are no voids/spaces
- Overfill the preparation
- Trim excess material and create mild anatomy
- Material may be smoothed by lightly burrishing with a damp cotton pellet
- Initial set occurs approximately 5 minutes from start of mix
 - Increased temperature, humidity, and powder/liquid ratio may affect setting time
- Upon set, remove matrix band if present
- Check and adjust occlusion as needed using hand and/or rotary instruments



www.pocketdentistry.com

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Temporary Restorations – RMGI

Fuji IX® (GC): Packable posterior restoration

- Apply the conditioner (mild polyacrylic acid) for 10-20 sec. rinse and dry
 - Removes the dentinal smear layer and conditions the dentin and enamel before application of the GI
- Activate capsule, triturate for 10 sec
- Place capsule in applicator/gun for delivery
- Working time is 2 minutes from start of mixing
- Higher temperature will shorten working time
- Once set, apply GC Fuji Varnish



www.dentistrytoday.com

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Temporary Restorations - RMGI

Photac-Fil® (3M) Quick Aplicap

- Dual cure resin-modified glass ionomer
- Apply conditioner (mild polyacrylic acid)
- Activate capsule, triturate for 10sec.
- Place capsule in applicator/gun for delivery
- Working time 2 min
- Apply in 2mm increments and light cure



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Glass Ionomer – Effect of Dehydration

- Depending on the compound, GIC's are susceptible to gaining or losing water during the setting reaction
 - Both can have significant clinical implications
- While in a **liquid state**: Protect against water contamination to prevent dissolution
- While in **solid state** (maturation): Protect against air spray/dehydration
 - Will result in a crazed, chalky, roughened surface
 - Thus, do not use air spray while carving and adjusting

Sidhu, S., Sheriff, M., Watson, T. (1997). *The effects of maturity and dehydration shrinkage on resin-modified glass-ionomer restorations. J Dent Res.* 76(8):1496-1501.



Glass powder (base)

- reactive (ionomer) glass
- lyophilized polycarboxylic acid

Cement liquid (acid)

- aqueous polycarboxylic acid
- tartaric acid

Powder liquid ratio
> acid-base reaction

Liquid state:
silica hydrogel forming
> water protection
(prevents dissolution)

Solid state:
hardened cement
> water addition
(prevents dehydration)

Mixing > 45 seconds

Initial setting time ~ 3 - 6 minutes

Maturation > 24 hours - 1 year

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Caries Control: A Case Example



Deep caries and normal periapical structures



CaOH₂ and IRM placed. After 60 days, no signs of apical radiolucency or dentin resorption)



Definitive restoration – GI liner and Composite

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Temporary Restorations - Other

- Used to protect tooth vitality, and against tooth sensitivity in cases of:
 - indirect procedures as inlays, onlays, crowns or bridges
 - or, any situation that requires tooth protection while treatment is in progress
 - Example: Fabrication of a temporary crown while a permanent crown is being created in the laboratory
- Temporaries are usually fabricated out of resin materials (PMMA) and cemented with ZOE type temporary cements



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Liners, Bases, and Temporary Restorations: Summary

- **Liners & Bases:**

- Are part of the definitive restoration
- Serve as chemical and thermal protectors
- They could be a 0.5-1mm thick (liner) or up to 2mm (base) in thickness

- **Temporary Restorations & Caries Control:**

- Placed for a limited time
- Serve as chemical and thermal protectors
- Cover/fill the entire restoration

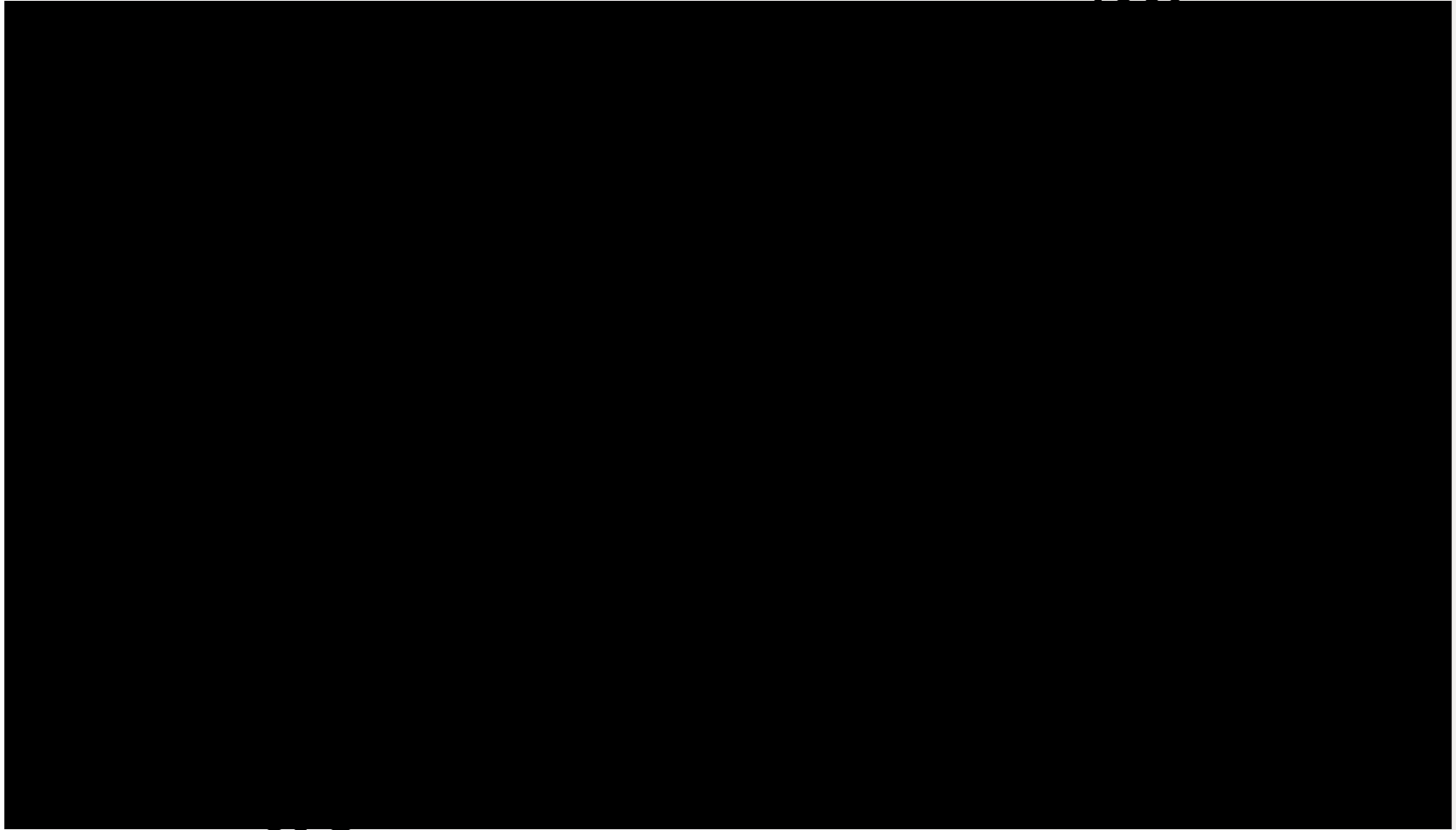
Summary

- Purpose of pulpal protection
- Compare and contrast liner, base and temporary restoration indications for use and placement techniques
- Commonly used materials for liners, bases, and temporary restorations

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Base and Liner Demo



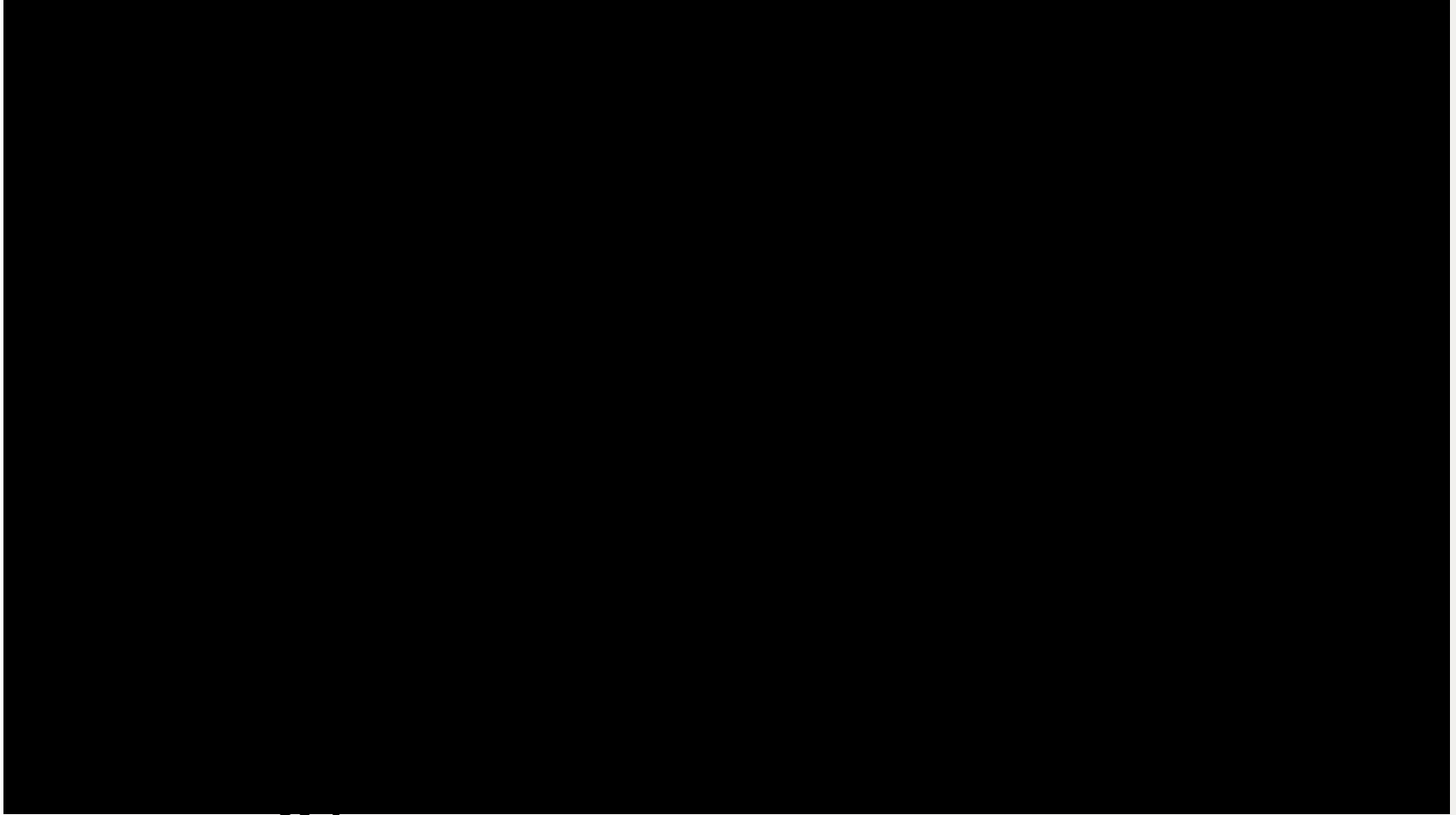
<https://www.youtube.com/watch?v=a7nEuPYvQkY>



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IRM Demo



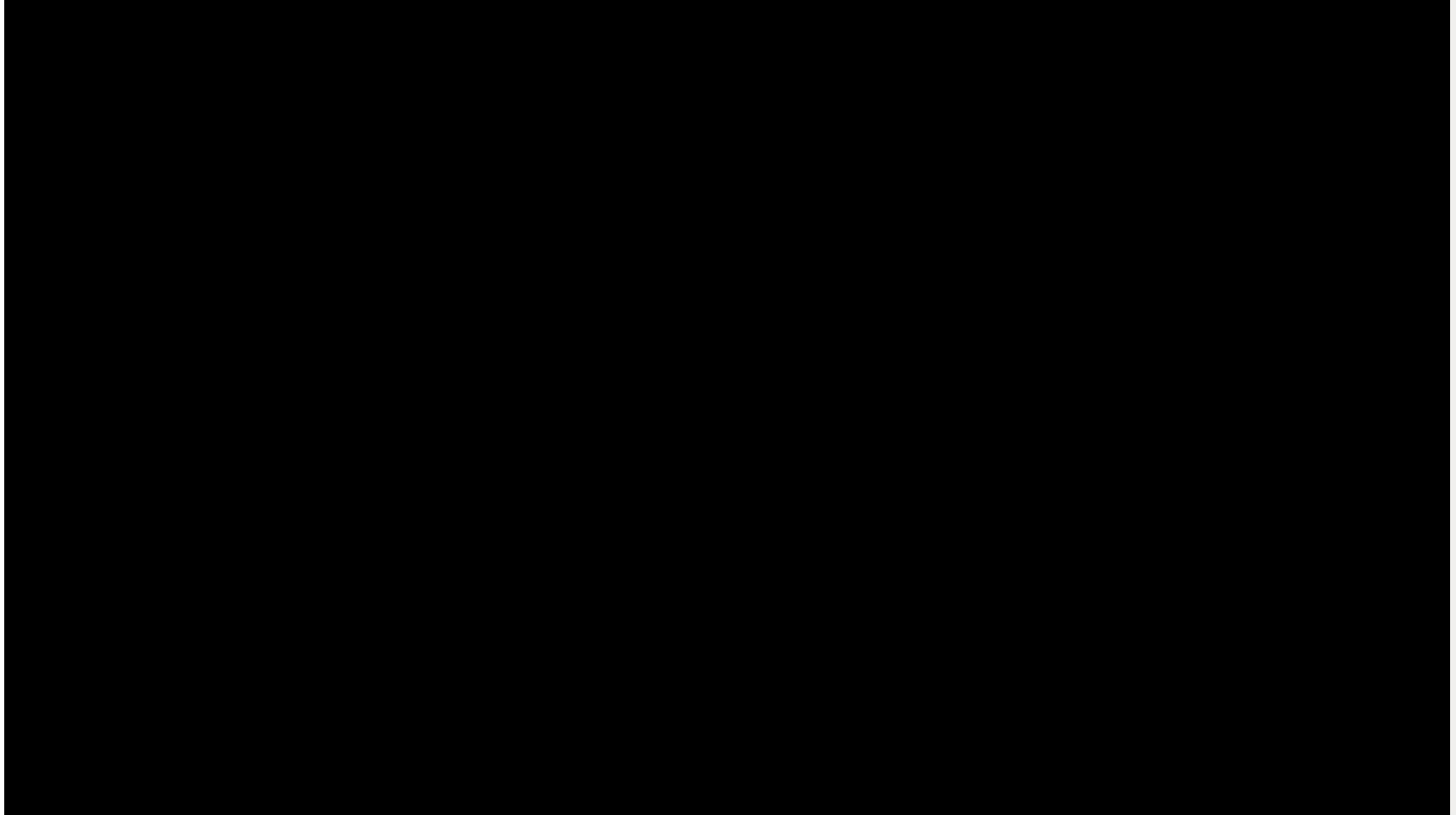
<https://www.youtube.com/watch?v=tgHOTCTmnSQ>



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IRM Demo



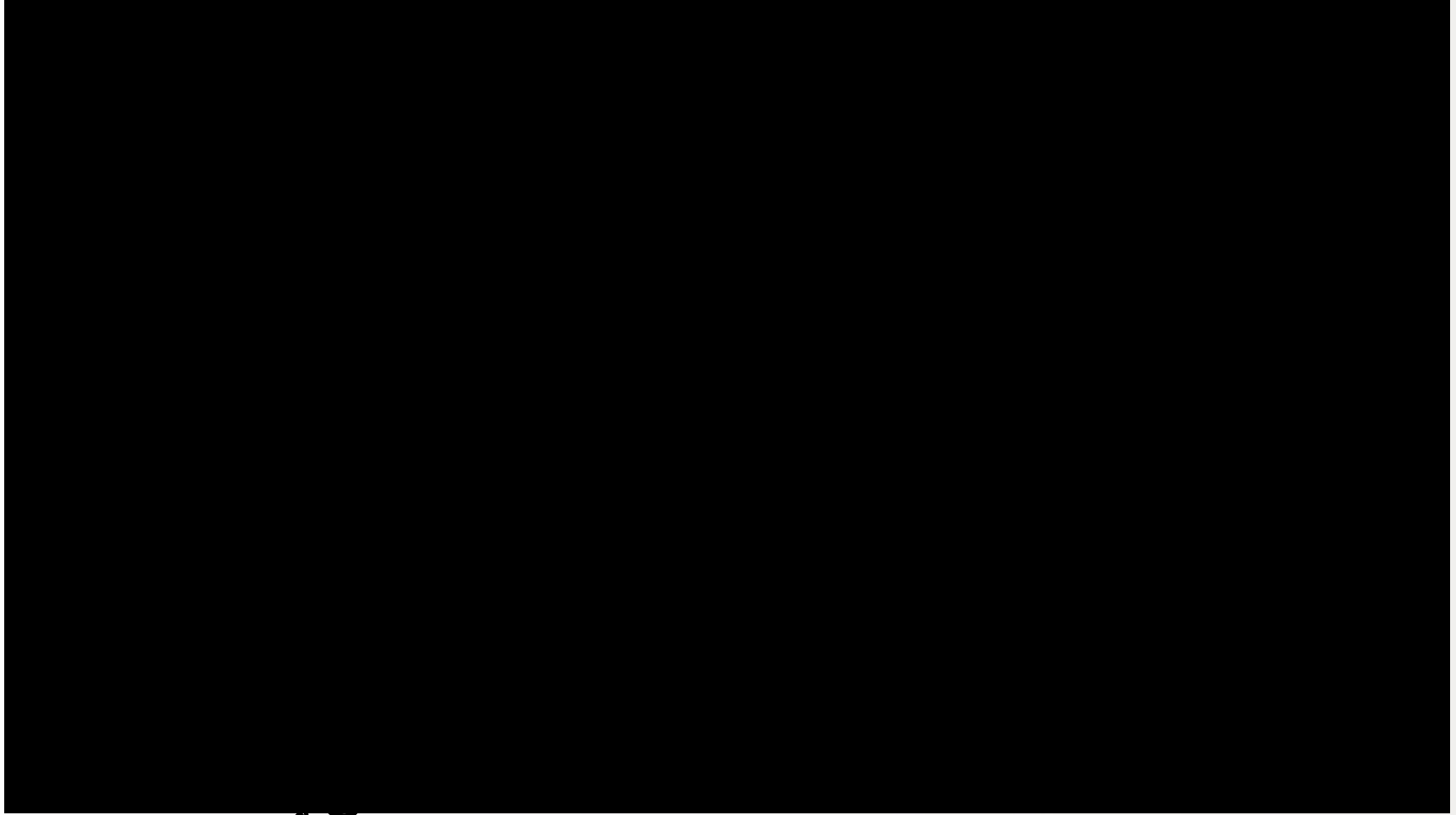
<https://www.youtube.com/watch?v=EOF8-VUKAiY>



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Glass Ionomer Demo



<https://www.youtube.com/watch?v=uo7ss8mQ1oU>



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Breakout!

- Break into two groups to practice mixing IRM
- Each participant will then practice the following skills:
 - IRM on #26MO
 - Glass ionomer on #26B
 - Liner and base on #14MOD

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