Chapter 44

Dental Liners, Bases, and Bonding Systems
Lesson 44.1

Dental Liners, Bases, and Bonding Systems

1. Pronounce, define, and spell the Key Terms.
2. Discuss how preparation of a tooth is determined.
3. Discuss how the sensitivity of a tooth determines what type of dental material is selected for a procedure.
4. Discuss how and why dental liners are used in restoring tooth structure.
5. Discuss how and why varnishes are used in restoring tooth structure.
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6. Discuss how and why desensitizers are used in restoring tooth structure.

7. Discuss how and why dental bases are used in restoring tooth structure.

8. Describe the etching process of a tooth and its importance in the bonding of tooth and material.

9. Describe the bonding systems and how they provide better adherence of dental materials to the tooth structure.
Introduction

- A variety of supplemental dental materials can be incorporated in a restorative and esthetic procedure for the health and well-being of the tooth that is being restored
  - Dental liners, bases, varnishes and bonding systems
**Table 44-1**

Supplementary Dental Materials and Application in Order of Use

<table>
<thead>
<tr>
<th>Type of Restorative Material</th>
<th>Shallow Preparation</th>
<th>Moderately Deep Restoration</th>
<th>Deep Restoration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amalgam</td>
<td>1. Desensitizer</td>
<td>1. Base</td>
<td>1. Liner</td>
</tr>
<tr>
<td></td>
<td>2. Bonding system</td>
<td>2. Desensitizer</td>
<td>2. Base</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Bonding system</td>
<td>Desensitizer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bonding system</td>
</tr>
<tr>
<td>Composite resin</td>
<td>1. Bonding system</td>
<td>1. Bonding system</td>
<td>1. Liner</td>
</tr>
<tr>
<td>Gold inlays/onlays</td>
<td>1. Bonding system</td>
<td>1. Base</td>
<td>1. Liner</td>
</tr>
<tr>
<td>Ceramic</td>
<td>1. Bonding system</td>
<td>1. Bonding system</td>
<td>Bonding system</td>
</tr>
</tbody>
</table>
Prepared Tooth Structures

- Design of the cavity preparation:
  - Provides strength within the tooth
  - Helps determine how the tooth will hold the restoration in place
Pulpal Responses: Types of Stimulus

- **Physical stimuli**
  - Example: *Thermal*, electrical

- **Mechanical stimuli**
  - Example: Handpiece, traumatic

- **Chemical stimuli**
  - Example: Acid from dental materials

- **Biologic stimuli**
  - Example: Bacteria from saliva
Dental Liners

- A thin layer of material placed at the deepest portion of the dental preparation to provide pulpal protection or dentinal regeneration
- Protects pulpal tissue from irritation caused by physical, mechanical, chemical, and biologic elements
- The health and condition of the tooth being restored determines what lining agent the dentist will select
Calcium Hydroxide

- A frequently selected type of cavity liner because of its unique characteristics:
  - Protects the pulp from chemical irritation through its sealing ability
  - Stimulates the production of reparative or secondary dentin
  - Is compatible with all types of restorative materials
Application

- Liners are supplied either as a two-paste system or as a light-cured material
- The material is placed prior to placement of the restorative material and with the use of a Dycal (calcium hydroxide) applicator
- Placed only on the deepest dentin surface of the preparation
- This material is not to be placed on enamel or in retentive grooves of the preparation
Placement of a Liner

Modified from Heymann HO, Swift EJ, Ritter AV: Sturdevant’s art and science of operative dentistry, ed 6, St Louis, 2013, Mosby.
Varnish

- Varnish is a liquid consisting of one or more resins in an organic solvent
- This material is placed within the entire preparation
Varnish (Cont.)

• Application accomplishes the following:
  - Seals dentinal tubules
  - Reduces microleakage around a restoration
  - Acts as a barrier to protect the tooth from highly acidic cements such as zinc phosphate
Application of Varnishes

- Applied with a small disposable applicator or with a cotton pellet held in sterile cotton pliers
- It is important to note that when a liner is placed, the varnish will be placed after the liner is applied
- Because dental varnish interferes with the bonding and setting reaction of composite resins and glass ionomer restorations, the use of varnish is contraindicated with these materials
Location for Placement of Cavity Varnish

Modified from Heymann HO, Swift EJ, Ritter AV: Sturdevant’s art and science of operative dentistry, ed 6, St Louis, 2013, Mosby.
Fluoride Varnish

- This gel-like substance is designed to release fluoride on enamel, root structure, and dentin structure

- Specific indications include:
  - Professional topical fluoride application
  - Treatment of hypersensitive cervical areas
  - Orthodontic patients
  - Cavity varnish
  - Dentin sealant
Desensitizer

- Used to treat or prevent hypersensitivity that a patient may experience from a newly placed direct or indirect restoration
  - Also referred to as a primer
- The material is designed to seal the dentinal tubules
- No surface layer of the preparation is prepared when a desensitizer is used; this makes the material ideal for use under all indirect restorations
Application of Desensitizer

- Most desensitizers contain hydroxyethyl methacrylate (HEMA) and glutaraldehyde
- This material is used sparingly
- Do not allow the material to contact soft tissue
Dental Bases

- When a tooth preparation becomes moderately deep to deep, the dentist will place a base under the permanent restoration.
  - A base is an additional layer to protect the pulp.

- Bases provide different types of pulpal protection:
  - Protective: Protects the pulp from a large restoration.
  - Insulating: Protects the tooth from thermal shock.
  - Sedative: Soothes pulp that has been damaged by decay or irritated by mechanical means.
Types of Base Materials

- **Zinc oxide-eugenol (ZOE)**
  - Could be selected for use as an *insulating* base and as a *sedative* base
  - Cannot be used under composite resins, glass ionomers, or other resin restorations

- **Zinc phosphate**
  - An excellent material because of its thermal insulation qualities

- **Polycarboxylate**
  - Nonirritating to the pulp
Application of Base

- The base material resembles a putty-like consistency because it actually provides a buffer or layer between the pulp and the restoration.
- The entire pulpal floor is covered with a base to a thickness of 1 to 2 mm.
Location for Placement of a Base

Varnish
RMGI base
Calcium hydroxide liner

Modified from Heymann HO, Swift EJ, Ritter AV: Sturdevant’s art and science of operative dentistry, ed 6, St Louis, 2013, Mosby.
Dental Etchant

- In preparation for the use of a bonding material, the tooth surface will need to be etched with an acidic *tooth conditioner*
  - When you rinse and dry an etched surface, it will have a distinct “frosted” appearance
- The use of *etchant* is critical for both enamel and dentin surfaces of a cavity preparation to form a better mechanical bond between the tooth and the permanent restorative material
Application of Dental Etchant

- The etchant material is supplied either as a liquid or gel, with gel being packaged in a syringe-type applicator.
- Syringe dispensing through pre-bent dispenser needles provides precise placement of the material on tooth.
- Fifteen to twenty seconds is the most common recommended time.
Dental Bonding

- The process of solid and/or liquid contact of one material with another at a single margin
- Retaining properties of bonding systems have been improved by the creation of *micromechanical* retention between the tooth structure and the restoration
A major factor in the success of bonding to dentin is the removal of the smear layer, which is a very thin layer of debris composed of fluids and tooth components that remain on dentin after cavity preparation has been completed.

- A slight amount of moisture must be maintained on the dentin so as not to *desiccate* or “dry out” the tooth.
- Before dentin bonding, the smear layer must be removed through application of etchant and the tubules opened.
Enamel Bonding

- Examples of enamel bonding:
  - Sealants
  - Bonding of orthodontic brackets
  - Resin-bonded bridges
  - Resin-bonded veneers

- When sealant, resin cement, or restorative material is placed on an etched surface, it flows in and around the enamel tags
  - The material hardens in this location to form a strong mechanical bond with enamel
Application of Enamel Bonding

- Bonding applications are available as self-curing, dual-cured, and light-cured systems
- Some systems use a single application, whereas others require the mixing of two liquids
- Each bonding system is different, and the material from one system is not interchangeable with that of another
- It is essential that the manufacturer’s instructions be followed exactly with each product
Application of Enamel Bonding (Cont.)

- The tooth surface receives the etchant material, which removes the smear layer.
- The bonding component is allowed to flow into these small defects and into the partially opened tubules in dentin.
- The material is allowed either to:
  - Harden and act as a hybrid layer.
  - Remain in a liquid state while the restoration is being placed, to bond together the tooth and the dental material.
Guidelines for Clinical Application of Bonding Products

- Remove any plaque or debris before beginning the bonding process
- Avoid overdrying the teeth; these products work best on a slightly moist tooth surface
- Note that too much bonding material is better than too little; multiple layers work best
- Ensure that the bonding solution covers all surfaces
- Avoid any contamination with saliva, blood, or debris, which will require the entire procedure to be redone
- Allow as much time as possible for the bond to mature before completing the restoration
Questions?