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Indirect Bonding in Orthodontic

Dr. Zela Margot Murray

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Advantages of Indirect Bonding:

1. Brackets are placed on a model first, which allows for more precise positioning than placing them directly in the patient's mouth.
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11. **Improved Accuracy:** Brackets are placed on a model first, which allows for more precise positioning than placing them directly in the patient's mouth.
12. **Time Efficiency (Chairside**): Since brackets are pre-positioned on a model, the actual bonding appointment is faster, reducing chair time for both patient and clinician.
13. **Better Visualization**: The clinician can take their time to align brackets properly on the model, allowing better three-dimensional visualization.
14. **Patient Comfort:** Less time in the chair = a more comfortable experience, especially for younger or anxious patients.
15. **Fewer Bonding Errors:** Reduces the chances of bracket misplacement, which can lead to fewer wire adjustments and shorter treatment times.
16. **Cleaner Bonding Environment:** Bonding all brackets at once with a transfer tray can reduce contamination risks (like moisture from saliva), especially in hard-to-reach areas.
17. **Easier Rebonding of Multiple Brackets:** If multiple brackets come off, they can be rebonded using the original transfer tray.
18. **Customizable Workflow:** Offers more flexibility for digital workflows, like using 3D scans and digital brackets.

Disadvantages of Indirect Bonding:

1. **More Lab Time:** It requires extra time in the lab to prepare the model, position brackets, and fabricate the transfer tray before the actual bonding appointment.
2. **Technique-Sensitive:** Accuracy in every step (from impression or scan to tray fabrication) is crucial. A small error in the lab process can lead to incorrect bracket positioning.
3. **Initial Cost:** Lab materials, digital software, and technician time can make it more expensive upfront compared to direct bonding.

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4. **Tray Fit Issues:** If the model or impression isn't perfect, the transfer tray might not fit well, which can compromise bracket placement.
5. **Not Ideal for All Cases:** Cases with erupting teeth, large restorations, or poor oral hygiene may not be good candidates due to difficulty in precise bracket placement or maintaining tray stability.
6. **Bracket Adhesion Risks:** Sometimes, brackets may not adhere properly when transferred from the tray, especially if moisture control is inadequate during bonding.
7. **Limited Chairside Flexibility:** If adjustments are needed during the bonding appointment, it's harder to reposition brackets on the spot compared to direct bonding.

MINIMUN ONE METHOD OF FABRICATION OF IDB TRAY

Silicone Putty and Clear Overlay Method (Traditional Technique)

- Working model with brackets positioned
- Silicone putty (e.g., lab putty or VPS)
- Clear vacuum-forming plastic sheet
- Vacuum-forming machine
- Scissors or trimming tools

Steps:

1. **Bracket Placement on Model:**
   - Accurately position and temporarily glue the brackets on a stone model of the patient's teeth.

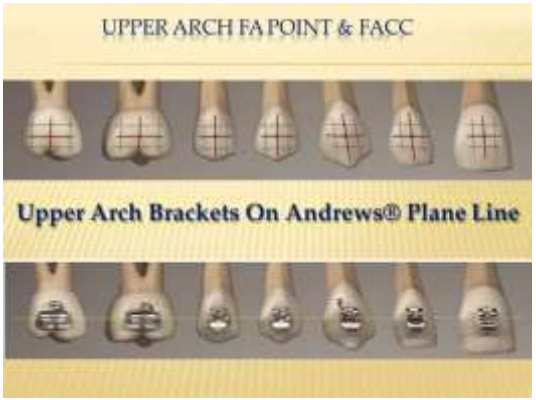
2. **Silicone Putty Layer:**
   - Mix and apply silicone putty over the bracketed arch to capture the detailed shape of the brackets and teeth.
   - Let it set completely.

3. **Clear Overlay:**
   - After the putty sets, use a vacuum-forming machine to adapt a thin clear plastic sheet (e.g., 1 mm thickness) over the model and the putty.
   - This creates a two-layer tray—rigid enough to hold brackets and flexible for easy removal.

4. **Trim the Tray:**
   - Cut and polish the tray so that it fits comfortably and accurately into the patient's mouth.

5. **Clean and Store:**
   - Clean the tray and store it for bonding.

MINIMUM ONE METHOD OF BRACKT PLACEMENT ON MODELS



Steps:

1. **Prepare the Working Model:**
   - Pour a high-quality stone model from an accurate impression or digital scan of the patient's teeth.
   - Ensure the model is dry, clean, and free from bubbles.

2. **Mark Long Axis and Bracket Position:**
   - Use a pencil to draw the long axis of each tooth.
   - Mark the ideal bracket position (usually at the midpoint of the clinical crown or per the treatment plan).

3. **Apply a Spot of Adhesive or Wax:**
   - Use a tiny dot of sticky wax or light-cure adhesive to temporarily hold each bracket in place.

4. **Use a Positioning Gauge or Ruler:**
   - A bracket positioning gauge helps you place brackets at consistent vertical heights (e.g., 4 mm from incisal edge for anterior teeth).

5. **Double-Check Positions:**
   - Check bracket orientation (angulation, height, and rotation) using a mirror or bracket placement chart.
   - Adjust as needed before the tray is fabricated.

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When you're fabricating and using an **Indirect Bonding (IDB) tray**, bonding involves **transferring brackets from the tray to the patient's teeth**. For this to be successful, you need proper **chemical agents** to create strong adhesion.

1. Etching

- **Purpose:** Prepares the enamel by creating micro-porosities.
- **Agent:37% Phosphoric Acid**
- **Time:** ~15–30 seconds (depending on manufacturer)
- **Rinse and dry** until the tooth looks frosty.

2. Priming

- **Purpose:** Enhances bond between etched enamel and resin.
- **Agent:Primer (resin-based bonding agent)** – often part of a system like Transbond XT.
- **Application:** A thin coat is applied and gently air-thinned.
- **Note:** Some systems use self-etch primers that combine etch + prime.

3. Adhesive Application

- **Purpose:** Bonds the bracket to the tooth surface.
- **Agent:Light-cure adhesive resin** (e.g., Transbond XT, Enlight, etc.)
- **Application:** Apply a small amount on each bracket base or directly on the tooth, depending on your technique.

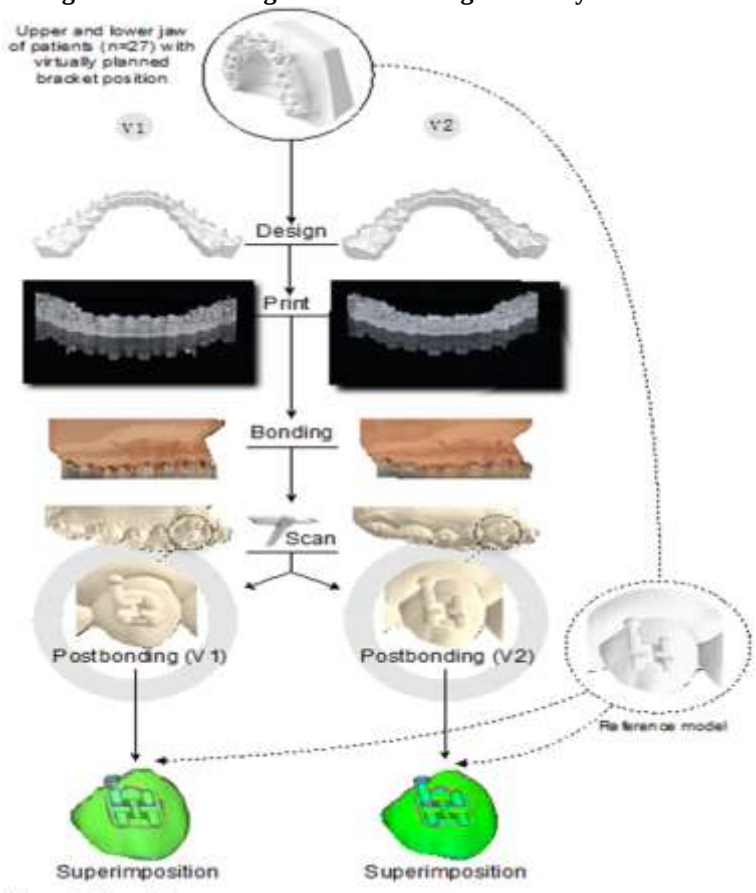
4. Tray Transfer

- The IDB tray (containing brackets) is seated on the teeth.
- **Pressure is applied** to ensure brackets contact the enamel surface correctly.
- **Light-curing** is done through the tray if it's clear, or sections are removed to allow access.

5. Tray Removal

- Once cured, carefully remove the tray, ensuring brackets remain on the teeth.
- Clean any flash/residual adhesive.

Understanding of Bonding and Chemical Agents Used During IDB Tray Fabrication



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1. Etching

- **Purpose:** Etching creates micro-porosities in the enamel surface to allow better mechanical retention of the adhesive.
- **Material Used:** 37% Phosphoric Acid.
- **Application Time:** 15 to 30 seconds.
- **Instructions:** Apply acid to enamel, rinse thoroughly, and air dry until enamel appears frosty white.

2. Priming

- **Purpose:** The primer penetrates the etched enamel and facilitates the bond between the tooth and the adhesive resin.
- **Material Used:** Light-cure bonding primer (e.g., Transbond XT Primer).
- **Application:** Apply a thin layer to etched enamel and gently air-dry. Some systems may use a self-etching primer.

3. Adhesive Application

- **Purpose:** Bonds the bracket base to the primed enamel.
- **Material Used:** Light-cure adhesive resin (e.g., Transbond XT, Enlight).
- **Application:** Apply adhesive to the base of each bracket or directly on the tooth surface before seating the tray.

4. Tray Placement and Light Curing

- **Purpose:** Transfers the brackets from the tray to the patient's teeth in their ideal positions.
- **Process:**
  - Carefully position the IDB tray on the teeth.
  - Apply firm pressure.
  - Light cure through the tray (if transparent) or in segments after partial tray removal.

5. Tray Removal and Finishing

- **Purpose:** Ensure brackets stay bonded while the tray is safely removed.
- **Process:**
  - Gently remove the tray.
  - Clean excess adhesive (flash) around brackets.
  - Check for bracket stability.

Materials Used for IDB Tray Fabrication:

1. **Working Model Materials:**
   - **Stone or Plaster Model**: Used to create an accurate replica of the patient's teeth (or digital model if using 3D scanning).
   - **Impression Material** (if needed for making a model): Alginate, VPS, or polyether.
2. **Silicone or Impression Putty:**
   - **Material Used**: Silicone putty (e.g., VPS or polyvinyl siloxane) to capture the detail of the bracket positions on the model.
   - **Purpose**: This forms the base layer of the tray to hold the brackets in place.
3. **Clear Vacuum-Forming Plastic:**
   - **Material Used**: Clear, thermoplastic sheets (usually 1-1.5 mm thickness).
   - **Purpose**: This is vacuum-formed over the model to create a flexible tray that holds the brackets during bonding.
4. **Resin-based Bonding Agents:**
   - **Material Used**: Light-cure bonding agents like Transbond XT for bonding brackets to teeth.
   - **Purpose**: Adhesive for bracket attachment.
5. **Wax (for Temporary Bracket Positioning):**
   - **Material Used**: Soft wax (e.g., orthodontic wax).
   - **Purpose**: Temporarily holds brackets in position on the model before tray fabrication.

Instruments Used for IDB Tray Fabrication:

1. **Tray Fabrication Tools:**
   - **Vacuum-Forming Machine**: To mold the thermoplastic sheet over the model.
   - **Tray Cutter or Scissors**: Used for trimming the formed tray after vacuum forming.
2. **Bracket Positioning Tools:**
   - **Bracket Placement Jig or Template**: Ensures consistent bracket positioning and alignment on the model.
   - **Bracketing Tweezers or Forceps**: For holding and placing individual brackets on the model.
3. **Trimming & Finishing Instruments:**
   - **Scalpel or Blade**: Used for trimming the excess putty around the edges of the tray.
   - **Sandpaper or Dremel Tool**: For smoothing and polishing tray edges to avoid irritation to the patient's gingiva.
4. **Light-Curing Unit:**
   - **Light-Curing Unit**: For polymerizing the adhesive and bonding material on the patient's teeth.
5. **Impression Tray or Model Holder:**
   - **Impression Tray**: For capturing the initial impressions.
   - **Model Holder**: Holds the model in place during fabrication steps.

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Materials Used for Bonding and Delivery of IDB Tray:

1. **Bonding Adhesives:**
   - **Material Used**: Light-cure bonding resin (e.g., Transbond XT, Transbond Plus) for bonding the brackets to the patient's teeth.
   - **Purpose**: To create a strong adhesive bond between the bracket and the tooth surface.

2. **Primer:**
   - **Material Used**: Resin-based bonding primers (e.g., Transbond XT Primer).
   - **Purpose**: To improve the bond strength between the etched enamel and the adhesive.

3. **Etching Gel:**
   - **Material Used**: 37% phosphoric acid gel.
   - **Purpose**: To etch the tooth surface and create micro-porosities for better bonding.

4. **Light-Cure Resin for Bracket Base:**
   - **Material Used**: Light-cure resin (like the bonding resin mentioned above).
   - **Purpose**: Used on the bracket base or the tooth to bond the brackets.

5. **Curing Light:**
   - **Material Used**: LED or halogen light-curing unit.
   - **Purpose**: To polymerize (harden) the adhesive after the tray is seated, ensuring a secure bond.

Instruments Used for Bonding and Delivery of IDB Tray:

1. **IDB Tray (Transfer Tray):**
   - **Instrument**: A customized transfer tray (either clear or with a soft silicone base) containing pre-placed brackets.
   - **Purpose**: Transfers the brackets from the tray to the teeth in the correct position.

2. **Bonding Forceps or Tweezers:**
   - **Instrument**: Fine-tipped forceps or tweezers.
   - **Purpose**: Used to handle and place individual brackets onto the tray if they need adjustment or placement before seating.

3. **Positioning Gauges or Template:**
   - **Instrument**: Positioning gauges for bracket height, angulation, and rotation consistency.
   - **Purpose**: To ensure all brackets are placed at the same correct height and in the proper position on the teeth.

4. **Orthodontic Bracket Placement Pliers:**
   - **Instrument**: Special pliers used for adjusting brackets on the tray.
   - **Purpose**: Helps with precise bracket alignment and seating during the delivery.

5. **Cotton Rolls and Retractors:**
   - **Instrument**: Cotton rolls or cheek retractors (e.g., a Lip retractor or cheek retractor).
   - **Purpose**: To help keep the area dry and expose the teeth for proper bracket placement.

6. **Air Syringe and Suction:**
   - **Instrument**: Air syringe and dental suction.
   - **Purpose**: To remove excess moisture, debris, or saliva from the tooth surface and tray.

7. **Light-Curing Unit:**
   - **Instrument**: LED or halogen light-curing unit.
   - **Purpose**: Cures the bonding resin through the tray (if clear) or after removing sections of the tray.

8. **Scaler or Explorer:**
   - **Instrument**: Small scaler or explorer.
   - **Purpose**: Used for cleaning up any excess adhesive or resin around the brackets after bonding.

9. **Clear Plastic or Silicone Tray:**
   - **Instrument**: The actual **transfer tray** that holds the brackets in place for easy delivery to the teeth.

10. **Wax (Optional):**
    - **Instrument**: Soft orthodontic wax.
    - **Purpose**: May be used temporarily on brackets during the trial phase to prevent bracket shifting before final curing.

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Step-by-Step Indirect Bonding (IDB) Technique:

Step 1: Preparation

- **Prepare the Patient:**
  - **Anesthesia**: Local anesthesia may be administered if necessary.
  - **Isolation**: Isolate the area using cotton rolls, cheek retractors, and suction to ensure the field remains dry.
  - **Clean the Teeth**: Use a prophy cup and pumice to clean the teeth and remove plaque, debris, and biofilm.

Step 2: Impression or Scanning

- **Traditional Impression**:
  - Take an impression of the patient's arch using an **alginate or VPS material** to create a model for bracket placement.

- **Digital Scan (if using CAD/CAM)**:
  - Use an **intraoral scanner** to capture a 3D digital impression of the patient's teeth.

Step 3: Create a Working Model

- **Stone Model (if traditional)**:
  - Pour the impression material into a dental stone and allow it to set.

- **Digital Model (if using digital technology)**:
  - The scan data is used to generate a 3D model of the teeth on a computer.

Step 4: Bracket Placement on Model

- **Apply Temporary Adhesive**:
  - Place a small amount of **temporary adhesive or wax** to hold the brackets on the model.

- **Position the Brackets**:
  - Position the brackets on the model in their ideal locations according to the treatment plan. Use a **bracket positioning jig** or **template** to ensure consistent bracket height, angulation, and rotation.

- **Check the Bracket Placement**:
  - Double-check that all brackets are positioned correctly using a **positioning gauge** or ruler.

Step 5: Tray Fabrication

- **Silicone Putty Layer**:
  - Apply **silicone putty** (like VPS) over the model to create a mold of the teeth and the positioned brackets. Ensure the putty covers the brackets entirely.

- **Vacuum-Forming**:
  - After the silicone putty sets, place a **clear thermoplastic sheet** in a **vacuum-forming machine**. Form the tray over the putty and the model to create a **custom transfer tray**.

- **Trim and Finish the Tray**:
  - Once the tray is formed, trim the edges and smooth any rough areas with a **scalpel** or **dental scissors**.

Step 6: Tooth Preparation (Intraoral)

- **Isolation**:
  - Isolate the teeth using a **dental dam**, cotton rolls, and cheek retractors.

- **Etching**:
  - Etch the enamel surface with **37% phosphoric acid gel** for about **15-30 seconds** to create micro-porosities.

  - **Rinse and Dry**: Rinse the acid off thoroughly and air-dry the enamel until it appears frosty white.

Step 7: Apply Primer and Adhesive

- **Primer**:
  - Apply a **bonding primer** (e.g., **Transbond XT Primer**) to the etched enamel surface and air dry to enhance the bond between the enamel and the adhesive.

- **Adhesive**:
  - Apply a thin layer of **light-cure adhesive resin** (e.g., **Transbond XT** or other resin-based adhesives) to each tooth or bracket base.

Step 8: Seat the Transfer Tray

- **Transfer Tray Positioning**:
  - Position the **IDB tray** (which contains the pre-positioned brackets) onto the patient's teeth.
  - Apply gentle pressure to ensure the brackets come into full contact with the tooth surfaces.
  - Check for proper bracket alignment and positioning during tray seating.

Step 9: Light Curing

- **Cure the Brackets**:
  - Use a **light-curing unit** (LED or halogen) to cure the adhesive through the transparent tray (if it is clear). Cure each bracket for the recommended time, typically **20-40 seconds per bracket**.

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- **Cure in Sections**:

If the tray is opaque, remove sections of the tray and cure each bracket one at a time.

Step 10: Tray Removal and Final Check

- **Remove the Tray**:
  - Gently remove the transfer tray, ensuring all brackets stay in place on the teeth.

- **Check Bracket Positioning**:
  - Verify that the brackets are properly positioned and aligned.

- **Clean Excess Adhesive**:
  - Use a scaler or explorer to remove any excess bonding resin around the brackets.

Step 11: Finishing

- **Polish the Brackets**:
  - Use a **fine finishing bur** or polishing wheel to smooth any rough edges around the brackets.

- **Final Adjustments**:
  - Ensure that the brackets are securely bonded and adjust if necessary.

- **Check Occlusion**:
  - Check the patient's bite and make sure there are no interferences or discomfort.

Step 12: Post-Bonding Care and Instructions

- **Patient Instructions**:
  - Instruct the patient on how to care for their braces, including avoiding hard or sticky foods, and maintaining good oral hygiene.

- **Follow-Up Appointment**:
  - Schedule a follow-up visit to check on the bracket positions and overall treatment progress.

Common Errors During IDB Tray Fabrication:

1. Incorrect Bracket Positioning on the Model

- **Error**: Brackets are not placed in the correct position or angulation on the working model.
- **Cause**: Incorrect use of the positioning gauge, improper bracket positioning, or lack of precision when placing the brackets.
- **Solution**: Use a bracket positioning jig or template to ensure consistent and accurate bracket placement. Double-check the positions using a digital or manual positioning system.

2. Poor Tray Fit

- **Error**: The IDB tray does not fit well over the patient's teeth, leading to inaccurate bracket transfer.
- **Cause**: Improper trimming of the tray, improper vacuum-forming, or poor model preparation.
- **Solution**: Ensure the tray fits snugly but comfortably over the model or patient's teeth. Check that the tray is not too tight or too loose. Trim any excess material and smooth sharp edges.

3. Air Bubbles in the Silicone Putty or Tray

- **Error**: Air bubbles are trapped in the putty mold or the vacuum-formed tray.
- **Cause**: Insufficient mixing of the silicone or improper handling of the putty.
- **Solution**: Mix the silicone putty thoroughly and handle it gently to avoid trapping air. Use a vacuum-forming machine with appropriate pressure to reduce the risk of bubbles.

4. Inaccurate Tray Thickness

- **Error**: The tray material is too thin or too thick, which can affect bracket transfer and bonding accuracy.
- **Cause**: Using a sheet of thermoplastic material that is either too thin or too thick.
- **Solution**: Choose the appropriate thickness for the vacuum-forming material (usually 1–1.5 mm) to ensure proper bracket retention and flexibility.

Common Errors During Bonding Procedure:

1. Improper Etching or Moisture Contamination

- **Error**: Etching is not applied evenly, or moisture is present on the tooth surface when applying the bonding agent.
- **Cause**: Inadequate isolation of the tooth, insufficient etching time, or poor moisture control.
- **Solution**: Use proper isolation techniques (cotton rolls, rubber dam, or cheek retractors) to ensure the tooth remains dry. Follow the manufacturer's recommended etching times and recheck the surface for proper frosting before bonding.

2. Inconsistent Primer or Adhesive Application

- **Error**: Uneven or inadequate application of the bonding primer or adhesive.

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- **Cause**: Failure to apply a thin, uniform layer of primer or adhesive, leading to weak bonding.
- **Solution**: Apply a thin and even layer of adhesive to the bracket base or tooth surface. Use a brush or applicator to ensure full coverage and avoid excess adhesive.

3. Bracket Misalignment After Tray Removal

- **Error**: Brackets are not in the correct position after removing the transfer tray.
- **Cause**: Insufficient pressure during tray seating or improper seating of the tray.
- **Solution**: Ensure proper tray seating by applying adequate and consistent pressure. Check bracket alignment before light curing.

4. Premature Curing

- **Error**: Light curing is done before the brackets are fully seated or before achieving ideal bracket positioning.
- **Cause**: Curing too early or without proper positioning of the brackets in the tray.
- **Solution**: Ensure the brackets are correctly positioned before starting the light-curing process. Only cure after confirming correct alignment.

5. Excess Flash or Adhesive Around Brackets

- **Error**: Excess adhesive or bonding resin is present around the brackets after the tray is removed.
- **Cause**: Failure to remove excess material before curing or improper tray fitting.
- **Solution**: Remove excess resin immediately before curing using a scaler or explorer. After curing, use a fine finishing bur or polishing tool to remove any remaining flash.

6. Inadequate Curing Time

- **Error**: Brackets are not fully cured, resulting in weak bond strength.
- **Cause**: Insufficient curing time or inadequate light exposure.
- **Solution**: Follow the manufacturer's guidelines for curing time, typically 20–40 seconds per bracket, ensuring proper light penetration.

7. Tray Removal Issues

- **Error**: The tray is difficult to remove, or the brackets detach during removal.
- **Cause**: Improper tray material selection, excess adhesive, or premature curing.
- **Solution**: Ensure the tray material is not too thick or rigid. Apply light pressure when removing the tray to avoid bracket displacement. If needed, remove sections of the tray to facilitate easy removal.