

# Etching Masks for Precise Indirect Bonding

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Indirect bonding techniques offer numerous advantages over direct bonding,<sup>1</sup> especially with self-ligating brackets. One disadvantage is the potential buildup of hard-to-remove flash at the bracket base, which can promote the formation of plaque and calculus.<sup>2</sup> An additional challenge with any bonding technique involves restricting the etchant to the area of the bracket base, avoiding contact with the soft tissues and any other surfaces not involved in the bonding.<sup>3</sup>

In this article, we propose a modification of the indirect bonding technique described by Fantozzi<sup>4,5</sup> that can reduce flash and is particularly suitable for self-ligating brackets. Our method involves laboratory fabrication of etching masks along with the transfer trays.

## Procedure

1. Use a rigid, solid tray to take impressions. We use a polyether material (Impregum Penta Soft Quick)\* because it produces a smoother surface than alginate does, resulting in a more detailed and accurate cast. Apply an adhesive to avoid partial

detachment and deformation of the impression.

2. Pour casts from the impressions. We recommend an ultrahard standard stone (Fujirock EP\*\*) for more exact reproduction and a finer and smoother surface compared to orthodontic plaster. Vacuum-mix the material to prevent bubble formation. After extracting the hardened cast from the impression, rough-trim it into a horseshoe shape about 25mm high (maximum 30mm) for easy and accurate fabrication of the transfer trays.

3. Mark the vertical axis, the buccal cusp, and the highest point of the gingival margin of each tooth with a .5mm-lead wax pencil (Margin Liner\*\*\*), consulting the panoramic x-ray for a clearer view.

4. Isolate the model with a single layer of separating liquid (Temp Sep†).

5. Determine the heights of the bracket slot centers, using a star gauge,† and mark them on the casts (Fig. 1).

6. Apply a thin layer of light-cured composite resin (Transbond XT‡) to the bracket bases.

7. Position the brackets on each cast, with the clips of self-ligating brackets open. Remove any excess composite from the bracket bases (Fig. 2).

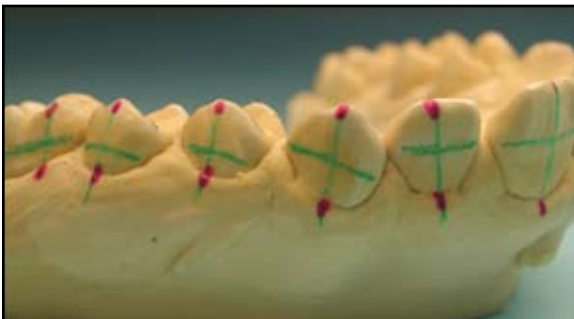


Fig. 1 Working cast with long axes and bracket heights marked in wax pencil.



Fig. 2 Excess composite removed from bracket base on cast.

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8. Finalize the bracket positions according to the reference markings.

9. Place each cast in a light-curing unit (Labolight LV-III†††) for five minutes. After polymerization, close the clips of self-ligating brackets.

10. Mark the outlines of the bracket bases on the cast with a different-colored wax pencil from the one used to mark the vertical axes and bracket heights.

11. Fabricate the two transfer trays for each cast in a positive-pressure thermoformer (Ministar S§). Make the first tray out of a .5mm elastic material (Copyplast Soft§) that holds the brackets securely yet is flexible enough to release them without disturbing their position when the tray is removed from the mouth. With a warmed #11 scalpel, trim this tray halfway up the clinical crown on the lingual side and to the gingival edge of the bracket base on the buccal side (Fig. 3). Use a harder material (.6mm Duran Hard§) to form a second tray over the first. This rigid tray will hold the brackets in position (Fig. 4).

12. Remove both trays from the cast with the brackets attached, and carefully separate the trays (Fig. 5). Trim the rigid tray on the lingual to the

gingival margin and on the buccal to the height of the bracket slots (Fig. 3), thus making it easier to remove from the mouth.

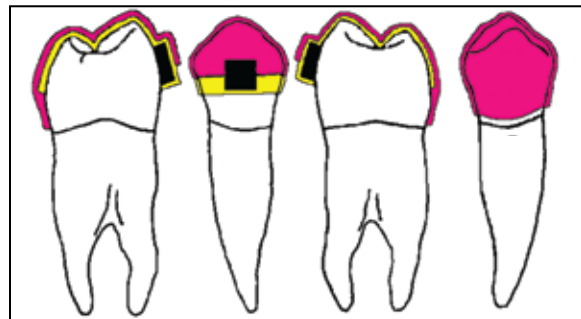


Fig. 3 Soft tray (yellow) extends buccally to cover entire bracket, holding it in place while covering half of clinical crown on lingual side. Rigid tray (pink) extends only to bracket slot to retain bracket without impeding tray removal during clinical phase.



Fig. 4 Rigid transfer tray formed over soft tray on cast.

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**Fig. 5 Separation of transfer trays.**



**Fig. 6 Transfer trays sectioned in buccolingual direction, distal to canines, with warmed scalpel.**



**Fig. 7 Etching mask fabricated by cutting out areas corresponding to bracket bases.**

13. Reposition both trays on the cast, and use a warmed #11 scalpel to cut the combined trays in a buccolingual direction (Fig. 6), dividing them into three sections: one anterior (incisors and canines) and two posterior (premolars and first molars). Then free the cast from the trays and brackets.

14. Use the cast to mold etching masks from a .5mm elastic material (Copyplast Soft§). With a warmed #11 scalpel, contour each mask about 2mm apically from the cervical margin (partly covering the gingivae) and cut holes corresponding to the outlines of the bracket bases (Fig. 7).

15. After both transfer trays and the etching mask have been prepared for each section (Fig. 8), clean

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**Fig. 8 Sectioned transfer trays and etching masks ready for delivery to orthodontist.**



**Fig. 9 Etching mask protects soft tissues and isolates enamel surfaces to be bonded.**



Fig. 10 Primer applied to etched tooth surfaces.

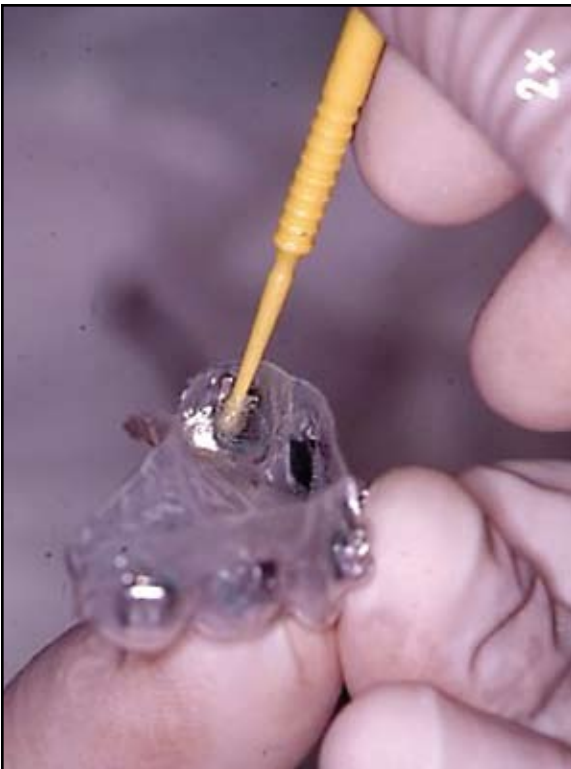


Fig. 11 Primer applied to bracket bases.



Fig. 12 Thin, transparent tray materials allow efficient light polymerization.

the facial surfaces of the appropriate teeth and place the etching mask over them. Apply the etchant for 30 seconds (Fig. 9). Remove the mask and rinse the teeth thoroughly for about 10 seconds. Dry the enamel until the etched areas have the typical chalky appearance.

16. Use an acetone solution (Hydro§§) to clean the bonding surfaces of the composite on the bracket bases. While keeping the area dry with an air syringe, carefully apply a layer of primer (Transbond XT‡) to the etched tooth surfaces (Fig. 10).

17. Apply primer to the bracket bases inside the transfer trays (Fig. 11), then fit the trays in the mouth. Light-cure the trays for 20 seconds each on the buccal, distal, mesial, and occlusal sides, for a total of 80 seconds per bracket (Fig. 12). The layer of primer will occupy the space of the separating liquid, preventing the primer from creating additional thickness between the tooth and the bracket base. Flash is minimized because etching is limited to the enamel surfaces needed for bracket adhesion.

18. Use a probe to remove the rigid transfer tray by detaching it from the brackets and rotating it lingually (Fig. 13). Then remove the soft tray by lifting it from the lingual side of the most distal tooth, freeing each tooth in turn.<sup>4</sup>

19. If using self-ligating brackets, open the clips,

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Fig. 13 Transfer trays removed with probe.



**Fig. 14** Archwire placed immediately after bracket bonding.

position an archwire in the slots, and reclose the clips (Fig. 14). If a bracket becomes detached, repeat steps 15-19, using the original tray.<sup>6</sup>

### Discussion

One of the most significant advantages of this technique is that the composite resin is applied to the bracket bases in the laboratory, allowing faster and more precise bracket placement than when it is applied in the mouth.<sup>2,7-11</sup> The layers of composite and primer are reduced to minimal thickness, thus avoiding improper bracket inclination. Removal of flash from the bracket bases before curing<sup>12,13</sup> prevents the build-up of plaque and calculus<sup>2</sup> that can interfere with the mechanism of a self-ligating bracket clip and make it difficult to open and close, or even create a lever effect that leads to bracket detachment.

The use of etching masks limits the etched enamel surfaces to the required areas.<sup>3,7,9,12</sup> These masks can be reused, even for single teeth, in case of accidental detachment. Other advantages of the method described here include the use of transparent transfer trays for homogeneous light-curing and

better visibility. The thinner trays are easier to insert and can be trimmed with a scalpel, thus avoiding the need for rotating instruments that can heat and deform the material.

This procedure represents a valid alternative to other indirect techniques supported by three-dimensional digital software.<sup>14</sup> It can reduce costs, expedite laboratory procedures, and shorten chair-time. Moreover, this readily repeatable technique can be safely delegated to qualified staff members.

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