

A Simplified Indirect Bonding Technique

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The indirect bonding technique was developed to improve the accuracy of bracket placement by transferring ideally positioned brackets from study casts to the patient's mouth.¹⁻⁹ Indirect bonding also reduces chairtime and patient discomfort.⁴ Although a randomized clinical trial found no difference in placement accuracy between direct and indirect bonding techniques, indirect placement produced much smaller error ranges.¹⁰ No statistically significant differences in shear bond strength have been found between direct and indirect procedures.^{11,12}

Most of the indirect bonding techniques that have been developed to date can produce accurate bracket placement, but can also be expensive and complicated. Various materials have been used to create full-arch transfer trays for indirect bonding,

including opaque silicone (Exaflex Very High Viscosity Putty^{*5}), translucent silicone (Memosil^{**6}), and thermoplastic materials (Bioplast,^{***9} Bioplast and Biocryl,^{***4} Copyplast^{***3}). White proposed the use of an inexpensive thermal glue to create the matrix of the transfer tray.^{7,8} The glue, a molten polymer of ethylene vinyl acetate, is FDA-approved, non-carcinogenic, non-toxic, and dimensionally stable in its solid form. Thermal glue matrices have proven effective and accurate in

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***Scheu Dental GmbH, Iserlohn, Germany, distributed by Great Lakes Orthodontics, Ltd., P.O. Box 5111, Tonawanda, NY 14151; www.greatlakesortho.com.



Fig. 1 Long axes of teeth marked on working cast.

	U7	U6	U5	U4	U3	U2	U1	UPPER ARCH
A	2.0	4.0	5.0	5.5	6.0	5.5	6.0	+1.0 mm
B	2.0	3.5	4.5	5.0	5.5	5.0	5.5	+0.5 mm
C	2.0	3.0	4.0	4.5	5.0	4.5	5.0	Average
D	2.0	2.5	3.5	4.0	4.5	4.0	4.5	-0.5 mm
E	2.0	2.0	3.0	3.5	4.0			
A	3.5	3.5	4.5	5.0	5.5			

Fig. 2 Slot heights marked on bracket placement chart.



Fig. 3 Brackets positioned using bracket height gauge.

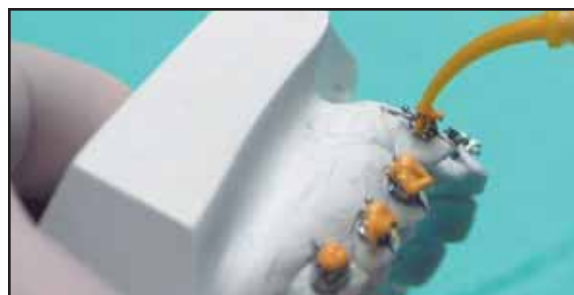


Fig. 4 Application of thin layer of medium-viscosity silicone impression material to brackets.

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clinical use. The present article describes a modification of the indirect bonding technique originally described by White.^{7,8}

Procedure

1. Take impressions of both arches using a heavy-bodied alginate in metal trays. Pour the casts with hard dental stone, let them dry, clean them, and eliminate any defects.
2. Mark the long axes of the clinical crowns on each working cast with a pencil (Fig. 1).
3. Measure the clinical crown heights with a dial caliper to calculate the bracket slot heights according to the bracket placement technique described by McLaughlin and colleagues¹ (Fig. 2).
4. With a brush, apply two coats of a separating agent (Leone R6320-00†) to all tooth surfaces, and allow them to dry fully.
5. Apply a light-curable composite adhesive to the mesh pad of each bracket. Position the bracket using the long axis mark and a bracket height gauge (Fig. 3), and press the bracket firmly against the tooth surface. Remove any excess adhesive with a spatula or a sickle probe. Affix the brackets with a light-emitting diode light-curing unit.
6. Apply a thin layer of medium-viscosity silicone impression material (Provil Novo Medium

C.D.2 Fast Set**) to the brackets to prevent the hot glue from seeping into the undercuts of the brackets, especially if self-ligating brackets are used (Fig. 4).

7. Use a glue gun to build the transfer tray, which will cover the facial surfaces and parts of the lingual and occlusal surfaces of the teeth (Fig. 5). Mold and closely adapt the hot glue before it sets (which takes only a few seconds) with a finger that is kept wet and insulated with cold water. Additional hot glue can be used to fill any voids in the matrix as it is formed.
8. Immerse each cast in water for a few minutes to allow the glue to fully harden and to separate the brackets from the cast.
9. Gently remove the transfer tray from the cast, and trim off excess glue with a scissor (Fig. 6).
10. Blow-dry the tray and brackets (Fig. 7).
11. Isolate the dentition for the bonding procedure. For moisture control, use cheek retractors (or OptraGate‡) in combination with Dri-Angles†† and an aspirator tip.

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††Dental Health Products, Inc., 2614 N. Sugar Bush Road, New Franken, WI 54229; www.dhpi.com.



Fig. 5 Glue gun used to build transfer tray.



Fig. 6 Excess glue trimmed from transfer tray.

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12. Insert the transfer tray into the patient's mouth to ensure that it fits properly (Fig. 8).

13. Prepare and etch the entire dentition as usual (we etch with 37% phosphoric acid gel for 20 seconds). Rinse and dry thoroughly.

14. Apply a thin layer of flowable composite resin (Tetric Flow[‡]) to each bracket pad (Fig. 9). A thin coat is essential to minimize excess bonding material.¹²

15. Seat the transfer tray firmly over the prepared teeth, applying just enough pressure to hold the matrix in place while avoiding distortion. Cure the adhesive with a light-emitting diode unit for 10 seconds on the occlusal surface of each tooth (Fig. 10).

16. Have the patient fill the mouth with warm water and hold it for at least two minutes. The warm water softens the glue and facilitates removal of the transfer tray.

17. Use a small scaler to gently lift the tray from the occlusal and lingual surfaces and roll it buccally, starting with the most distal bracket and twisting mesially until all the brackets are released (Fig. 11).

18. Remove the residual silicone material from the brackets. Any excess composite resin around the bracket bases can be removed with an ultrasonic scaler. The brackets are now ready for archwire insertion (Fig. 12).

Discussion

A successful indirect bonding technique allows accurate positioning of the brackets on all teeth, uses transfer trays with sufficient strength to hold the brackets securely in place while the adhesive polymerizes, reduces the duration of the bonding procedure and thus patient discomfort, and



Fig. 7 Finished transfer tray, with brackets ready for bonding.



Fig. 9 Application of thin layer of flowable composite resin to each bracket pad.



Fig. 8 Transfer tray positioned in patient's mouth to check for proper fit.



Fig. 10 Brackets bonded with light-emitting diode light-curing unit.



Fig. 11 Removal of transfer tray.



Fig. 12 Final appearance of bonded brackets.

minimizes laboratory expense and chairtime.¹³ Indirect bonding using thermal glue transfer trays is inexpensive, simple, accurate, and reliable.

The modified technique described here has several advantages over the procedure originally developed by White.^{7,8} Using a composite resin instead of a water-soluble adhesive to bond the brackets to the working cast reduces the amount of excess adhesive. The use of a flowable composite as the bonding agent allows any excess around the bracket base to be easily removed with an ultrasonic scaler.

White suggested partial coverage of the brackets with the transfer trays, recommending that the glue be kept away from the bracket slots to avoid problems during tray removal.⁷ In our technique, the application of a thin layer of medium-viscosity silicone impression material prevents the thermal glue from seeping into the undercuts of the brackets, allowing complete bracket coverage without significantly increasing the cost of the procedure. The silicone layer facilitates removal of the transfer tray and reduces the risk of debonding. Extension of the glue matrix to the buccal surfaces of the teeth increases the stiffness of the transfer tray, preventing distortion of the matrix and reducing mistakes in bracket positioning.

This procedure can be used to bond a full arch, including brackets and molar tubes for the first and second permanent molars. Trays in two or three sections can be used if the field of vision is restricted, however, or if cheek and tongue retraction is too difficult.

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