A New and Improved Indirect Bonding Technique

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Most orthodontists will agree that brackets can be positioned more accurately on study casts than directly on teeth in the mouth. Yet as recently as 1996, fewer than 10% of orthodontists routinely used an indirect bonding technique.[1] Reasons commonly given for not using the indirect method are the expense of the materials, the additional laboratory procedure, the necessity of training laboratory personnel, and the difficulty in achieving consistent and predictable adhesion to the teeth.

Most of the popular indirect bonding techniques require a matrix made from either a silicone impression material[2] or a vacuum-formed resin.[3] Over the past 20 years, I tried practically every method published, but I routinely failed to get the all the brackets to adhere to the teeth. Usually, two or three brackets would come out with the matrix when it was removed. It seemed to me that the matrices I used were not rigid enough to hold the brackets close against the teeth during composite polymerization. I am now convinced that this looseness or excessive flexibility is the major cause of bond failures with indirect techniques.

I have recently discovered a more rigid matrix material that still has enough elasticity and flexibility to permit easy removal after polymerization. The Surebonder DT-200 dual-temperature hot-glue gun* (Fig. 1) uses a polymer of ethylene vinyl acetate, which is FDA-approved and is non-toxic and non-carcinogenic. Such thermal glues are widely utilized in industry and home-building.

The inexpensive Surebonder works with mini-glue sticks, whose flow is easier to control than that from the larger sticks. In effect, the gun is simply a heating element that liquefies the solid glue stick and then places the glue where it is needed. Although the gun has a dual temperature control, the higher temperature tends to produce bubbles within the molten matrix; the lower temperature is hot enough for indirect bonding. The hot-glue matrix seldom fails to attach all the brackets to the teeth, and it has been much more reliable than any technique I have used.

Procedure

• Pour hard stone casts of both arches from either alginate or polyvinylsiloxane impression materials. Clean the models, and eliminate any defects. With a pencil, draw the axial midlines on the teeth to be bracketed (Fig. 2).

I use an Ormco bracket gauge** with lead

*FPC Corporation, 355 Hollow Hill Drive, Wauconda, IL 60084.

**Ormco/"A" Company, 1717 W. Collins Ave., Orange, CA 92867.

Fig. 1 Surebonder DT-200 dual-temperature hot-glue gun.

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Fig. 2 Axial midlines drawn on teeth to be bracketed.

Fig. 3 Bracket positions scribed with Ormco bracket gauge.

points to scribe lines for the bracket positions (Fig. 3). Many recommended bracket slot heights have been published, but I prefer a slight modification of the ones suggested by Magness[4] (Table 1). These measurements must be varied according to the available crown heights, but the ratio of one bracket height to another will remain constant. More often than not, the second bicuspids will dictate the other bracket positions because of their delayed and limited eruption.

- After marking the teeth on the cast, apply two thin coats of separating liquid to all the tooth surfaces, and allow the separator to dry.
- The laboratory technician can now place the brackets on the casts with a small amount of Aleene's Tacky Glue,*** an inexpensive, water-soluble adhesive often used by hobbyists (Fig. 4). This glue sets quickly and must be manipulated immediately to properly position the brack-

***Aleene's, Buellton, CA.

TABLE 1
RECOMMENDED BRACKET SLOT HEIGHTS (MM)

	Maxillary	Mandibular
Central Incisor	4.00	4.00
Lateral Incisor	3.75	4.00
Cuspid	4.50	4.50
First Bicuspid	4.25	4.25
Second Bicuspid	4.00	4.00
First Molar	3.75	3.75
Second Molar	3.50	3.50

Fig. 4 Aleene's Tacky Glue.

et. The technician should check the height of each bracket with a bracket gauge as it is placed. The orthodontist, when reviewing the setup later, can quickly reposition any brackets with a small amount of fresh Tacky Glue (Fig. 5).

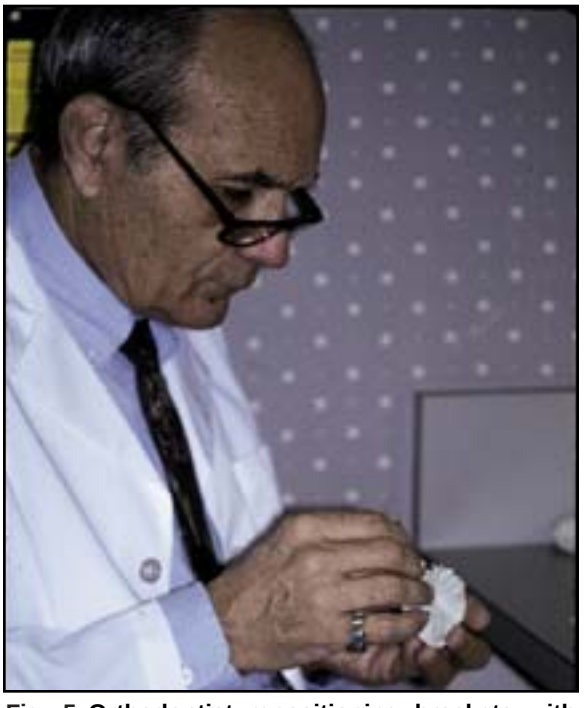

Fig. 5 Orthodontist repositioning brackets with fresh Tacky Glue.

Fig. 6 Glue gun used to form molten matrix over entire lingual and occlusal surfaces and part of facial surfaces of teeth and brackets, with care taken not to get glue in bracket slots.

• Spray the brackets with Pam (or a silicone spray) to lubricate their surfaces and make it easier to remove the matrix after composite polymerization.

• Use the glue gun to form a molten matrix over the entire lingual and occlusal surfaces and part of the facial surfaces of the teeth and brackets. The brackets should be covered only partially, with care taken not to get hot glue in the bracket slots; this will make it much more difficult to remove the matrix and does not add much to its stiffness (Fig. 6).

Before the hot glue sets, which takes only a few seconds, the technician should pat the molten glue into a close conformation, using a

Fig. 7 Using wet finger, technician pats molten glue into close conformation with teeth and brackets.

Fig. 8 Remaining glue brushed away with soft-bristle toothbrush and cold water.

Fig. 9 Border of matrix trimmed with scissor.

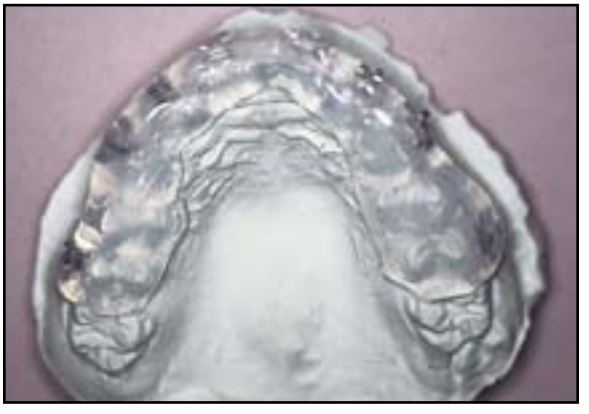

Fig. 10 Matrix stored on cast for quick reference to malocclusion.

finger that is kept wet, insulated, and lubricated by means of a nearby bowl of water (Fig. 7).

• After the glue cools and hardens, submerge the matrix and brackets in water for about 30 minutes to dissolve the Tacky Glue and separate the matrix and brackets from the cast. Soak the brackets and matrix for another hour or so; any remaining glue can then be easily brushed away with a soft-bristle toothbrush and cold water (Fig. 8).

• Trim off excess glue from the border of the matrix with a scissor (Fig. 9).

The hot-glue matrix has proven dimensionally stable and could probably be stored by itself, but I prefer to keep it with the cast for a quick reference to the malocclusion (Fig. 10).

Fig. 11 Teeth isolated with cheek retractors.

Many of the popular bonding techniques require special treatments of the brackets, such as microetching, thermal curing, or surface preparation with chemicals. The advantage of using Tacky Glue is that no further preparation of the brackets is needed, either in the laboratory or at chairside. Nothing remains on the brackets except the original mesh, and no additional procedures are necessary other than adding the bonding composite.

Clinical Management

The water supplies in my area of the United States have high concentrations of fluoride, which makes composite bonding extremely unreliable. Fluorosed enamel often shows a minimal response to etching with 37% phosphoric acid. Microetching the enamel, using the technique first reported by Miller,[5] can increase the bondable surface area. Although microetching alone apparently has little clinical effect,[6] microetching followed by a chemical etch of phosphoric acid seems to greatly enlarge the bondable surface area of fluorosed enamel.

• After microetching, isolate the teeth in one arch. If the retractors are combined with triangular absorbent pads held against the cheeks and a

Fig. 12 Excel A and B filled composite pastes mixed on treated paper attached to frozen glass slab.

guard that keeps the tongue toward the back of the mouth, an antisialogogue will not be necessary (Fig. 11).

• Etch the teeth to be bonded for 20 seconds each with 37% phosphoric acid, then thoroughly rinse them with water and dry them with warm air.

• Mix two drops each of Excel† A and B unfilled sealant, and paint this mixture over the teeth.

• After attaching a small piece of treated paper to a frozen glass slab, mix equal amounts of Excel† A and B filled composite pastes (Fig. 12). The lower temperature slows the chemical curing of the composite and allows much more time for buttering the mixture over the bracket mesh with a toothpick (Fig. 13). When the matrix is placed in the mouth, however, the sudden temperature change accelerates the setting time.

• Seat the matrix and brackets on the teeth, applying only enough pressure to hold the matrix in place without distorting it. Hold the matrix for two minutes, then allow it to cure further while the other arch is bonded (Fig. 14). The same composite can be used for both arches if it is mixed at a reduced temperature.

Curing can be accelerated further by blowing warm air over the teeth and matrix (Fig. 15).

†Trademark of Reliance Corporation, P.O. Box 678, Itasca, IL 60143.

Fig. 13 Composite mixture spread over bracket mesh with toothpick.

Fig. 14 Hot-glue matrix and brackets held in place for two minutes.

Fig. 15 Curing accelerated with warm-air dryer.

Fig. 16 Matrix removed using small scaler with gentle prying motion.

Fig. 17 Composite light-cured through clear matrix.

The warm air has the additional benefit of softening the matrix, making it much easier to remove from around the bracket wings. Use a small scaler with a gentle prying motion (Fig. 16). There is seldom any flash of excess material, but any composite remaining between the teeth should be removed with dental floss.

The hot-glue technique has a particular appeal for those who use light-cured composites, since the clear matrix allows light to penetrate completely (Fig. 17). I usually apply the light for 40 seconds per tooth. Although light-curing takes more chairtime than is required for chemically cured composites, the new argon laser units reduce curing time to five seconds or less per tooth and permit the clinician to apply more direct pressure against each individual bracket[7] (Fig. 18).

Molars can be bonded with this method, but since they bear more occlusal pressure, their bonds often break. I ordinarily bond from bicuspid to bicuspid, insert a dead-soft introductory archwire, and then place separators for molar bands (Fig. 19). Separators should not be placed at the impression appointment, since they will move the teeth enough that the matrix will not fit. For the same reason, it is also better to delay

Fig. 18 AccuCure 1000 Argon Laser Curing System (LaserMed Corporation).

Fig. 19 Typical bicuspid-to-bicuspid initial archwire.

any extractions until later. A week or two after the bonding appointment, the patient returns for band cementation and placement of nickel titanium archwires.

Conclusion

The hot-glue matrix offers a reliable and inexpensive method for transferring accurately placed brackets to the teeth. Whereas the cost of materials for other methods using thermal-cure adhesives, polyvinylsiloxane impression materials, and filled bonding composites can approach $10 per patient, the Tacky Glue and hot glue together cost less than 10 cents per patient.

Nevertheless, the main advantage of this new indirect technique is its dependability. It is not a foolproof method, but with ordinary precautions, it is the most predictable indirect bonding system I have ever used.

The final proof of any clinical procedure is the enthusiasm of the people who work with it daily. In the past, there were only pessimistic moans when I announced a trial for a new indirect bonding method. Now, every assistant is quick to acclaim the improvement in bracket placement, the conservation of time, and the greater patient comfort we have achieved with this system. Returning to the old ways would invite a staff rebellion.

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