

# Modified bonding technique for a standardized and effective indirect bonding procedure

Fabio Ciuffolo,<sup>a</sup> Nicola Tenisci,<sup>b</sup> and Luca Pollutri<sup>b</sup>  
Pescara and Chieti, Italy

This article describes a modified technique for indirect bonding. Crucial variables that influence the procedure are analyzed and discussed to help the clinician use the indirect bonding technique routinely. (Am J Orthod Dentofacial Orthop 2012;141:504-9)

Orthodontists use the indirect bonding technique to enhance accuracy in bracket positioning.<sup>1,2</sup> Brackets are positioned on a cast and then successively transferred to the patient's mouth via customized trays.<sup>1,2</sup> The indirect technique saves time in the office and reduces the patient's discomfort compared with direct techniques.<sup>3</sup> No differences in accuracy<sup>4</sup> or shear bond strength<sup>5,6</sup> were found between direct and indirect procedures; however, fewer mistakes (smaller range values) were observed when using the indirect technique.<sup>4</sup>

Many kinds of indirect bonding procedures have been proposed; some are characterized by the type of tray (eg, silicone,<sup>7</sup> thermal glue,<sup>8,9</sup> rapid prototyped<sup>10</sup>), type of adhesion system (eg, light curable<sup>11</sup>), or type of bracket-positioning guide (eg, slot heights<sup>1</sup>).

Despite the availability of several proposed indirect techniques, the indirect procedure is not yet the gold standard, probably because of numerous procedural variables that must be controlled to obtain successful indirect bonding. The aim of this article was to present a modified, standardized indirect bonding technique for routine and effective use of the indirect bonding procedure.

This indirect bonding technique is performed in 3 stages.

## In-office stage

1. Using heavy-bodied alginate, take impressions of both arches. Use the blue hard dental stone to make the casts; after they are dried, clean them and remove the defects.
2. Make the bracket-positioning guide on the model (Fig 1) as follows: using a black pencil, mark the facial axis of the clinical crown, overcoming the gingival margin, and, using a red pencil, mark the labial projection of the marginal ridges of the first and second premolars and the first molars; then, measure the clinical crown heights with a caliper and calculate the slot heights according to the method of McLaughlin et al.<sup>1</sup> Using a black-pencil gauge, mark the slots on the incisors, canines, and molars; use a caliper to calculate the distance between the molar slot (Fig 1, *black line*) and its marginal ridge (*red line*); reproduce this distance on both the second and the first premolars, marking the slots.
3. Deliver both the cast and the appliance to a laboratory technician trained in the following technique.

## In-laboratory stage

4. Apply a layer of separating agent (Unifol; Perident Dental Products, Florence, Italy; Fig 2) on the tooth surfaces with a brush and permit the cast to dry fully.
5. Put a light-curable composite adhesive (Transbond; 3M Dental Products, St Paul, Minn) on each bracket base, press firmly on the tooth surface, and remove any excess (Fig 3). Position each bracket, aligning its slot and its axis to the marked slot and to the marked facial axis of the clinical crown. Once the positioning on the full arch is finished, light-cure the

<sup>a</sup>Private practice, Pescara, Italy.

<sup>b</sup>Technician, private practice, Chieti, Italy.

The authors report no commercial, proprietary, or financial interest in the products or companies described in this article.

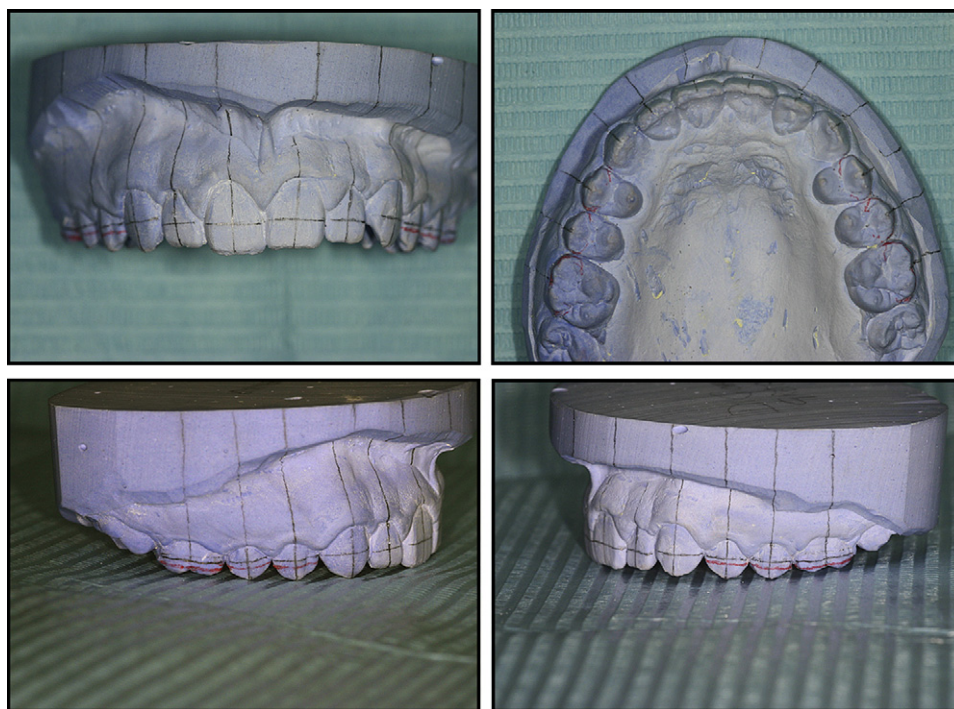
Reprint requests to: Fabio Ciuffolo, DDS, PhD, via Nazionale Adriatica Nord, 124/126, 65013 Marina Città Sant'Angelo, Pescara, Italy; e-mail, [fabio@studiociuffoloferritto.it](mailto:fabio@studiociuffoloferritto.it).

Submitted, August 2010; revised and accepted, September 2010.

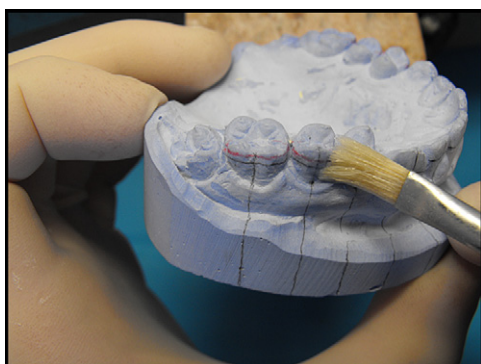
0889-5406/\$36.00

Copyright © 2012 by the American Association of Orthodontists.

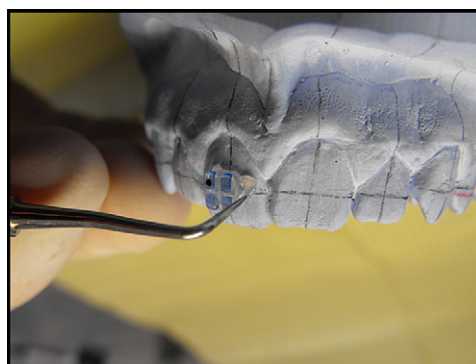
doi:10.1016/j.ajodo.2010.09.035



**Fig 1.** The bracket-positioning guide on the model.



**Fig 2.** Application of the separating agent.



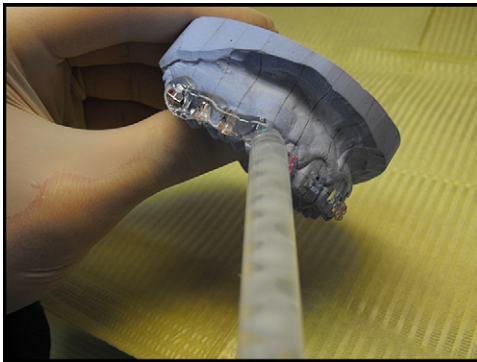
**Fig 3.** Positioning of the bracket according to the bracket-positioning guide.

adhesive in a dedicated machine (Fotolab UV; Tissi Dental, Milan, Italy).

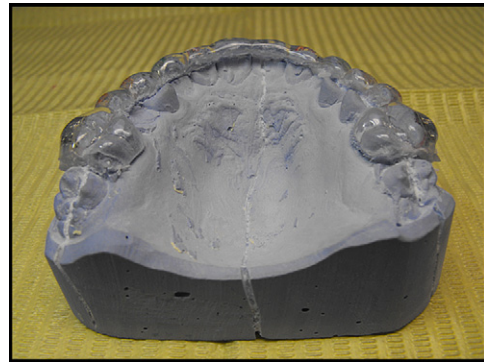
6. Using a thin layer of translucent soft silicone (Emiluma; Opal Orthodontics, South Jordan, Utah), cover the brackets labially and occlusally (Fig 4), allow it to harden, and remove any excess silicone; thermo-form a 1-mm thick rigid tray on the arch (Erkopress ES-200E; Erkodent, Pfalzgrafenweiler, Germany; Fig 5) and trim the disc, creating 2 palatal ears on the last tooth of each side; allow it to cover the premolar labial cuspids, the canines tips and the

incisor edge in the rest of the arch (Fig 6). Labially, cut the tray at the slot level, permitting the silicone to cover the entire bracket.

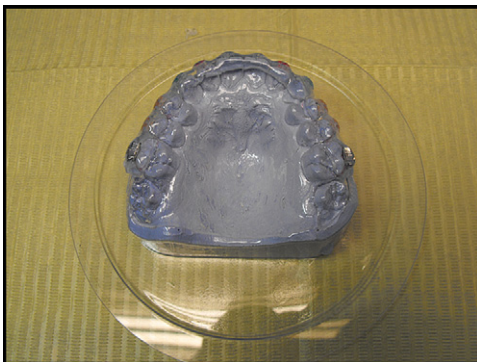
7. Soak the model in water for 30 minutes and then gently debond the brackets from the model (Fig 7); clean the residual stone and separating agent with 50- $\mu$ m size sand in a dedicated machine (Uno; Tissi Dental) at 1 bar of pressure, and then wash the transfer tray with a toothbrush and soap, rinse, and dry fully.



**Fig 4.** Application of the translucent soft silicone to make the soft layer of the tray.



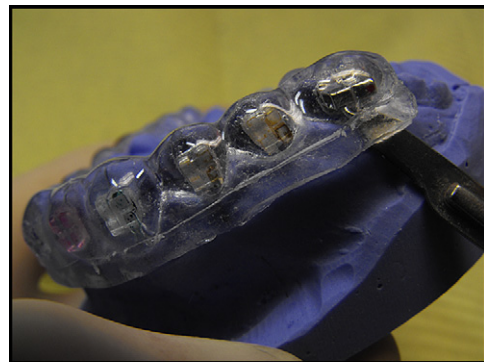
**Fig 6.** Rigid tray refinement to give the desired tray shape.



**Fig 5.** Disc thermo-forming to make the rigid tray.

#### In-office transfer stage

8. Polish the tooth surfaces.
9. Isolate the dentition to obtain a dry field (Nola Dry Field System; Great Lakes Orthodontics, Tonawanda, NY).
10. Prepare the tooth surfaces by etching with 37% phosphoric acid gel for 30 seconds. Rinse and dry fully.
11. Apply a thin layer of primer (Transbond MIP; 3M Dental Products) on the teeth (Fig 8) and then apply the self-curing components A and B (Sondhi Rapid Set; 3M Dental Products) on the teeth and the bracket bases, respectively (Figs 9 and 10).
12. Firmly seat the transfer tray with both hands, maintaining 2 vectors for 60 seconds (Fig 11): one stabilizes the tray on the arch, and the other keeps the brackets and the tooth surfaces matched. After the first minute, leave the tray on for 3 minutes more, to complete the self-curing process.



**Fig 7.** Removing the tray with a scalpel.

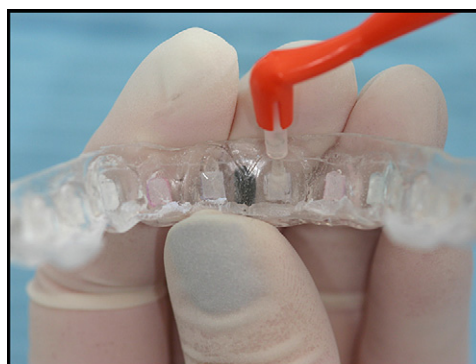


13. With a utility tool, remove the thermo-formed tray, lifting it first from the palatal ears (Fig 12, A and B) and next from the anterior labial margins (Fig 12, C), and then remove the silicone layer and any residual primer with the utility tool (Fig 12, D).
13. Remove the dry field system and engage the wire (Fig 13).





**Fig 8.** Application of the primer.



**Fig 10.** Application of component B.



**Fig 9.** Application of component A.



**Fig 11.** Seating the transfer tray manually.

## DISCUSSION

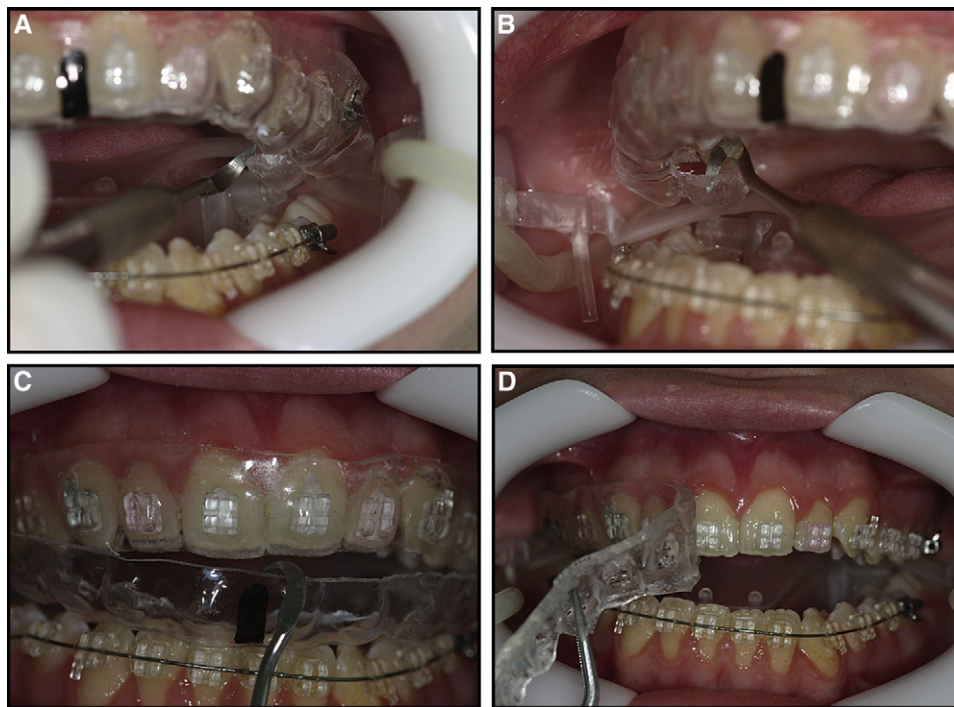
The indirect bonding technique must be reliable to achieve successful results: precise bracket positioning and chair-time savings. To have a reliable procedure, all variables that might influence the technique must be controlled. The control of these variables can be summarized in the 3 points discussed below.

The first crucial point, since everything starts from a good impression, is that the bracket-positioning guide traced on the model must be done by the orthodontist because it is a clinical issue (root-inclination evaluation and individualization of bracket positioning because of deepbite or open bite, tooth display, smile, and so on), whereas the bracket position can be assessed by the technician if he or she is properly trained. This method means a reasonable amount of in-office time to have a clinically precise bracket position on the model that allows aligning the teeth and leveling the arch with the marginal ridges.

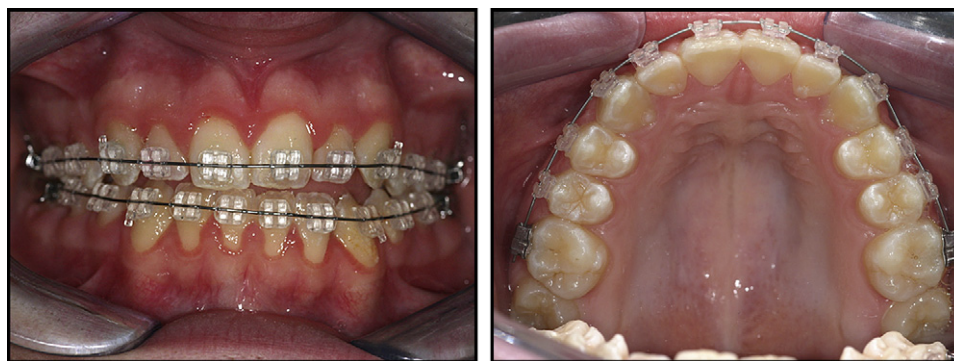
The curing phase is the second crucial point. The use of a bracket base with predosed light-cured adhesive, as

in this modified technique, respects the anatomy of each tooth surface, preventing both the errors in bracket positioning from excess adhesive and the “hard flushes” that must be removed with the scaler tool. On the contrary, the Sondhi Rapid Set does not cause errors because of the liquid consistency of the 2 components, which can be manually removed by the utility tool at the end of the process; however, it is important to use just a drop of each component to cover the surface of the bracket base. Another important advantage related to the self-curing indirect system is the time savings. This self-curing process takes about 4 minutes and needs no attention (except in the first minute); it is significantly shorter than the indirect light-curing process (if it takes 30 seconds for each bracket from first molar to first molar), which also requires active attention all the time.

The type of tray is the third and probably the most important variable that can make the difference between a successful and an unsuccessful indirect bonding. The transfer tray must have 2 main specific features: stability in the positioning and ease in the



**Fig 12.** A-D, Removing the rigid and soft trays.



**Fig 13.** End of the procedure and wire engagement.

removing. The tray used in this modified technique was made of two layers: the external rigid one and the internal soft one. The external layer, made of a rigid thermo-formed tray, allowed very good stability during the insertion, as well as easy removal due to its design (two back palatal ears and slot level trim; Fig 12, A-C). The internal layer, made of soft silicone, contained the appliance and eliminated undercuts during removal due to its elasticity (Fig 12, D). At this point, the residual excess can be cleaned manually with the utility tool, and it is possible to start some rebonding because the retractor is still worn;

otherwise, the operator can remove the dry field system and engage the wire.

This technique can be used with a single tray from first molar to first molar, even in arches with an erupting tooth, leaving occlusal space for the eruption in the tray. It also helps in making the bonding step a standardized procedure that can be routinely performed in approximately 30 minutes with the archwire engaged. The advantage of this technique is that it can be integrated with techniques that use computer-aided design and manufacturing technologies for indirect bonding.

## REFERENCES

1. McLaughlin RP, Bennett JC, Trevisi H. Systemized orthodontic treatment mechanics. Edinburgh, Scotland: Mosby; 2001.
2. Rajagopal R, Venkatesan A, Gnanashanmugham K, Harish Babu S. A new indirect bonding technique. *J Clin Orthod* 2004;38:600-2.
3. Sondhi A. Efficient and effective indirect bonding. *Am J Orthod Dentofacial Orthop* 1999;115:352-9.
4. Hodge TM, Dhopatkar AA, Rock WP, Spary DJ. A randomized clinical trial comparing the accuracy of direct versus indirect bracket placement. *J Orthod* 2004;31:132-7.
5. Linn BJ, Berzins DW, Dhuru VB, Bradley TG. A comparison of bond strength between direct- and indirect-bonding methods. *Angle Orthod* 2006;76:289-94.
6. Yi GK, Dunn WJ, Taloumis LJ. Shear bond strength comparison between direct and indirect bonded orthodontic brackets. *Am J Orthod Dentofacial Orthop* 2003;124:577-81.
7. Kalange JT. Ideal appliance placement with APC brackets and indirect bonding. *J Clin Orthod* 1999;33:516-26.
8. White LW. A new and improved indirect bonding technique. *J Clin Orthod* 1999;33:17-23.
9. White LW. An expedited indirect bonding technique. *J Clin Orthod* 2001;35:36-41.
10. Ciuffolo F, Epifania E, Duranti G, De Luca V, Raviglia D, Rezza S, et al. Rapid prototyping: a new method of preparing trays for indirect bonding. *Am J Orthod Dentofacial Orthop* 2006;129:75-7.
11. Fortini A, Giuntoli F, Franchi L. A simplified indirect bonding technique. *J Clin Orthod* 2007;41:680-3.