A New Low-Friction Ligation System

ARTURO FORTINI, MD, DDS
MASSIMO LUPOLI, MD, DDS
VITTORIO CACCIAFESTA, DDS, MS

Many factors can contribute to the frictional resistance of edgewise appliances,[1-7] including bracket and wire materials and cross-sections, surface conditions of the archwires and bracket slots, torque at the wire-bracket interface, interbracket distance, the presence of saliva, and the functions of the oral environment.[8-11] Schumacher and colleagues found, however, that friction was determined mostly by the type and force of ligation.[12]

The first self-ligating bracket was the Russell attachment, introduced in the mid-1930s to reduce chairtime and improve operator efficiency.[13,14] More recently, two broad classifications of self-ligating brackets have been developed: the active type, in which the spring clip presses against the archwire (SPEED,* In-Ovation,** Time***), and the passive type, in which the clip does not contact the wire (TwinLock,† Damon†).

Every self-ligating bracket, whether active or passive, uses the movable fourth wall of the bracket to convert the slot into a tube. Several studies have demonstrated a significant reduction in friction with self-ligating brackets compared to conventional designs.[3,15-20] This can help shorten treatment, especially in extraction cases, where tooth translation is achieved by sliding mechanics.

Self-ligating systems do have several limitations, however:

- Full expression of bracket torque is difficult to achieve.
- Clinical management is more problematic than with conventional brackets due to frequent failure of the clips.
- The brackets are bulkier and more expensive than other edgewise brackets.
- Oral hygiene is more difficult because of the brackets' complex geometry.

This article describes an alternative to self-ligating systems: a ligature that markedly reduces the amount of friction between the archwire and the edgewise bracket. The Slide‡ ligature enables the archwire to apply the desired amount of force without the resistance of conventional ligatures, thus reducing treatment time and producing more stable results.

Low-Friction Ligature System

The Slide ligature, made of a special medical polyurethane, is applied to the bracket in the same way as a conventional elastomeric ligature (Fig. 1). Like a passive self-ligating bracket, it

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†Trademark of Ormco/"A" Company, 1717 W. Collins Ave., Orange, CA 92867.

‡Leone, Via P. a Quaracchi, Sesto Fiorentino, Italy.

Fig. 1 Slide low-friction ligature tied into edgewise bracket.

Dr. Fortini is a Clinical Assistant Professor and Dr. Cacciafesta is an Assistant Professor, Department of Orthodontics, University of Pavia, Pavia, Italy. Dr. Lupoli is a Visiting Professor, Department of Maxillofacial Surgery, University of Florence. Dr. Cacciafesta is also an Assistant Professor, University of Insubria, Varese, Italy, and is in the private practice of orthodontics in Pavia. Dr. Lupoli is also in the private practice of orthodontics in Florence, and Dr. Fortini is in the private practice of orthodontics at Via G. Meoni 48-52, 59100 Prato, Italy; e-mail: artfort@tin.it.

Dr. Fortini

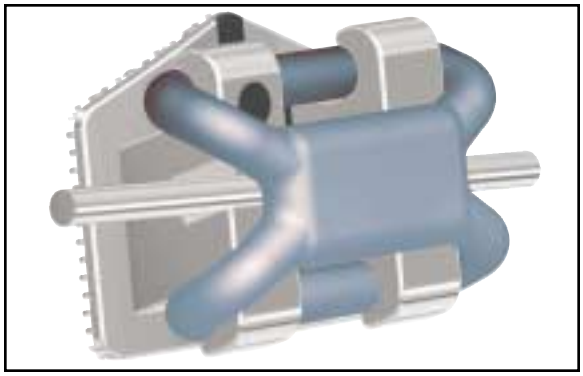
Dr. Lupoli

Dr. Cacciafesta

allows the archwire to slide freely in the slot while transmitting its full force to the tooth (Fig. 2). The Slide ligature also forms a buffer between the brackets and the soft tissues, considerably improving patient comfort (Fig. 3).

Slide ligatures are specifically designed for use with STEP brackets,‡ but are available in three sizes to fit any type of edgewise appliance, including ceramic brackets (Fig. 4). To meet the demands of younger patients, the ligatures are manufactured in various colors (Fig. 5).

Slide ligatures can be used in cases where considerable leveling and alignment are required,



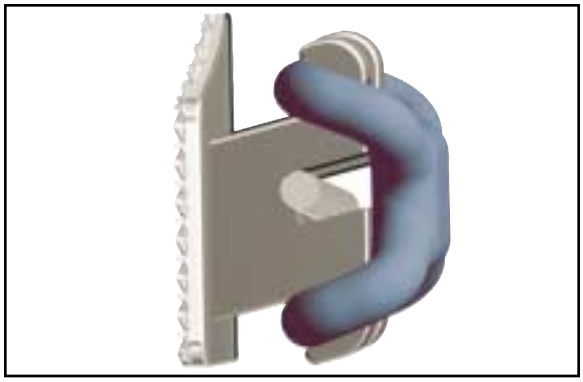


Fig. 2 Slide ligature forms fourth wall of slot, allowing archwire to slide freely while transmitting full force to tooth.

Fig. 3 Difference in thickness of STEP brackets with Slide ligatures (A) compared to self-ligating Damon 2 brackets (B).

Fig. 4 Slide ligatures with ceramic brackets.

Fig. 5 Various colors of Slide ligatures.

Fig. 6 Slide brackets used on cuspid and premolar brackets for sliding mechanics during space closure.

Fig. 7 Case 1. 12-year-old female patient with bimaxillary protrusion, severe crowding in both arches, and transposed upper right canine and first premolar.

Fig. 8 Case 1. Upper .020" stainless steel archwire and compressed-coil spring used to move right canine mesially; lower .014" superelastic nickel titanium archwire tied in with Slide ligatures.

Fig. 9 Case 1. A. Patient at start of treatment. B. Lower .016" superelastic nickel titanium archwire used with elastic chain for extraction space closure. C. Lower left canine completely aligned after eight weeks.

as well as in patients who need sagittal or transverse expansion. The advantages of the system are especially evident in the early stages of orthodontic treatment, when the archwire can slide freely inside the tunnel between the bracket slot and the ligature.

The system also enables the clinician to apply friction and reduced-friction mechanics simultaneously on the same archwire by using Slide ligatures only in particular segments. For example, during en masse space closure on a rectangular stainless steel archwire, Slide ligatures can be used in the posterior segments to reduce friction, while conventional ligatures are used in the anterior segment to maximize torque expression and control (Fig. 6).

Case 1

A 12-year-old female presented with a bimaxillary protrusion, severe crowding in both arches, and transposition of the upper right canine and first premolar (Fig. 7).

After extraction of the right first premolars, preadjusted STEP brackets were bonded in the upper arch, and an .020" Gold Tone‡ stainless steel archwire and compressed-coil spring were used to move the upper right canine mesially (Fig. 8). In the lower arch, an .014" superelastic nickel titanium archwire was tied into preadjusted STEP brackets with Slide low-friction ligatures.

Once the lower left canine had been partially aligned, the archwire was changed to .016" superelastic nickel titanium; the extraction space was closed with elastic chain (Fig. 9). After eight weeks of treatment, the lower left canine was in proper position.

Case 2

In this 11-year-old female with a Class II malocclusion, the initial upper molar distalization was retained with a modified Nance button (Fig. 10). An upper .014" superelastic nickel titanium archwire was then tied into preadjusted STEP brackets with Slide ligatures (Fig. 11). No lacebacks were required to move the upper right canine. In the lower arch, an .020" Gold Tone stainless steel archwire was placed with bend-

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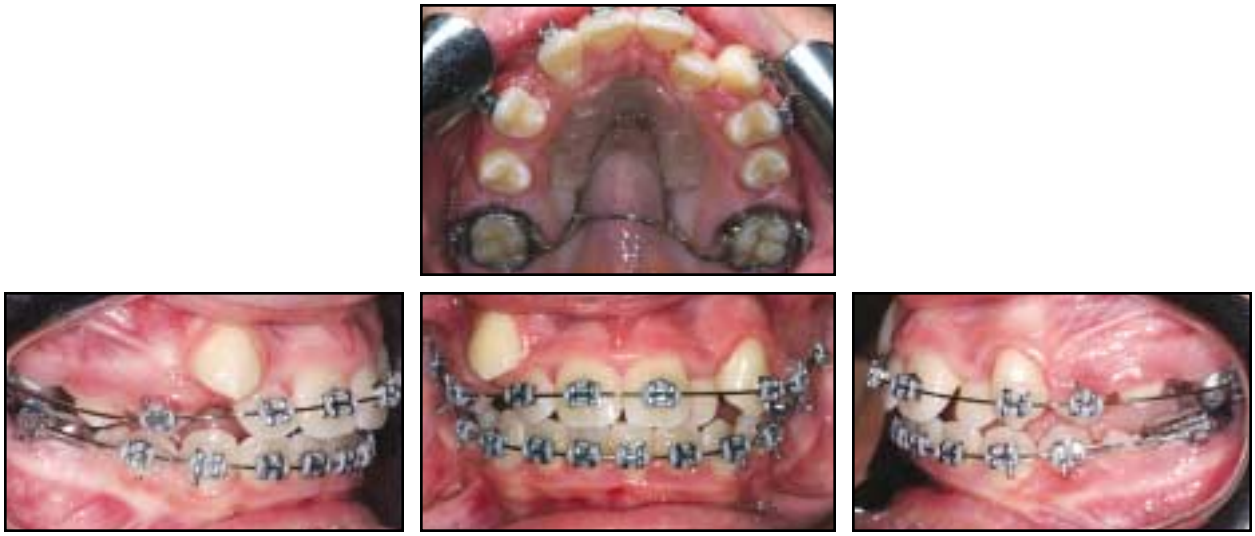

Fig. 10 Case 2. 11-year-old female Class II patient after initial upper molar distalization, retained with modified Nance button.

Fig. 11 Case 2. Upper .014" superelastic nickel titanium archwire, with Slide ligatures and no lacebacks; lower .020" stainless steel archwire with bend-backs.

Fig. 12 Case 2. Upper right canine leveled after 32 days without intrusion of adjacent teeth.

backs.

After 32 days of this phase of treatment, the upper right canine had been leveled without any intrusive side effects on the adjacent teeth or posterior anchorage reinforcement (Fig. 12).

Case 3

A 13-year-old female presented with a skeletal and dental Class III malocclusion (Fig. 13). Preadjusted STEP brackets were bonded in the upper arch, and an .016" Gold Tone stainless steel archwire was inserted with a laceback to the left canine (Fig. 14).

Low-friction mechanics were then initiated with an .014" superelastic nickel titanium archwire, using Slide ligatures and no lace- or bend-backs (Fig. 15). Enough space was gained in seven weeks to align the upper right canine (Fig. 16).

Conclusion

The user-friendly Slide low-friction ligature can be employed with any edgewise bracket without altering the clinician's preferred mechanotherapy. This system offers advantages over self-ligating brackets in controlling friction, while increasing patient comfort and potentially reducing treatment time.

(text continued on p. 470)

Fig. 13 Case 3. 13-year-old female patient with skeletal and dental Class III malocclusion.

Fig. 14 Case 3. Upper .016" stainless steel archwire with laceback to left canine.

Fig. 15 Case 3. Low-friction mechanics with .014" superelastic nickel titanium archwire and Slide ligatures.

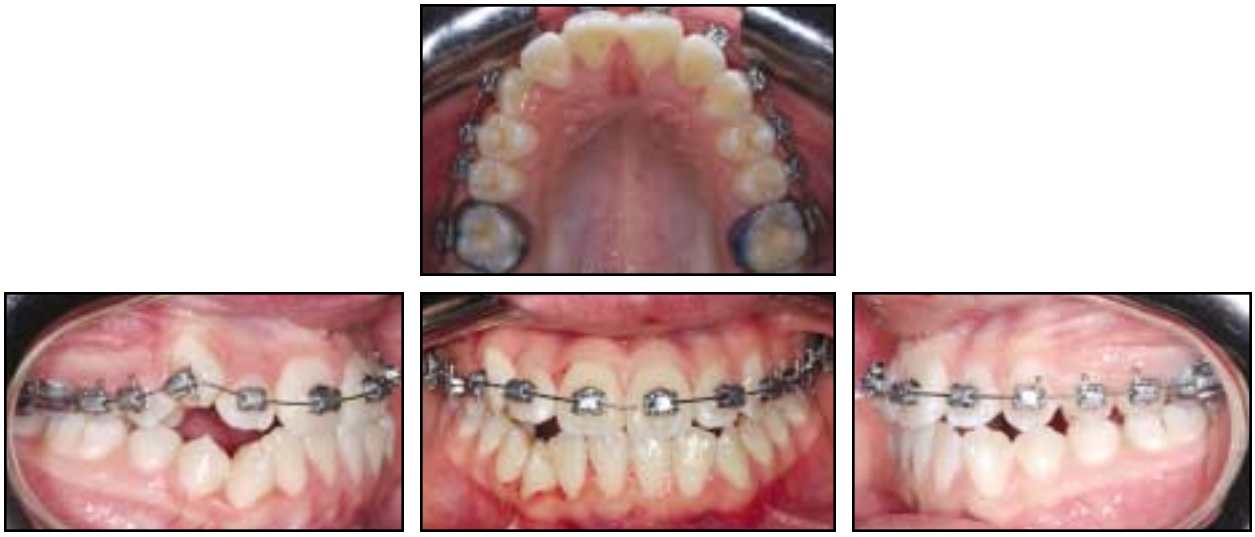

Fig. 16 Case 3. Alignment of upper right canine after seven weeks of treatment.

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