Update on the Fujita Lingual Bracket

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During the past 20 years, various lingual brackets have been designed and modified for patient comfort, mechanical efficiency, and precise tooth positioning.

Fujita's lingual bracket, introduced in 1979, featured a slot that opened toward the occlusal. A lock pin was inserted mesiodistally into a groove in the slot to secure the archwire, in conjunction with a conventional elastomeric or steel ligature.[1] This article describes the current Fujita lingual bracket system, which incorporates many design improvements over the original.

Appliance Design

The Fujita lingual bracket is still based on an occlusal slot opening, but brackets for the anterior teeth and premolars now have three slots: occlusal, lingual, and vertical (Fig. 1). Molar brackets have five slots: one occlusal, two lingual, and two vertical. Each of the three types of archwire slots provides different capabilities for efficient tooth movements.

The .019" × .019" main occlusal slot allows easier archwire insertion, seating, and removal than with lingually opening slots (Fig. 2). An additional benefit is that the archwire will not pull out of the slot during space closure.

Rotations should be corrected as early as possible, using light wires that can be deflected to full bracket engagement. In a lingually opening slot system, failure to adequately seat the archwire in the base of the slot causes rotation problems. These can be avoided by using the

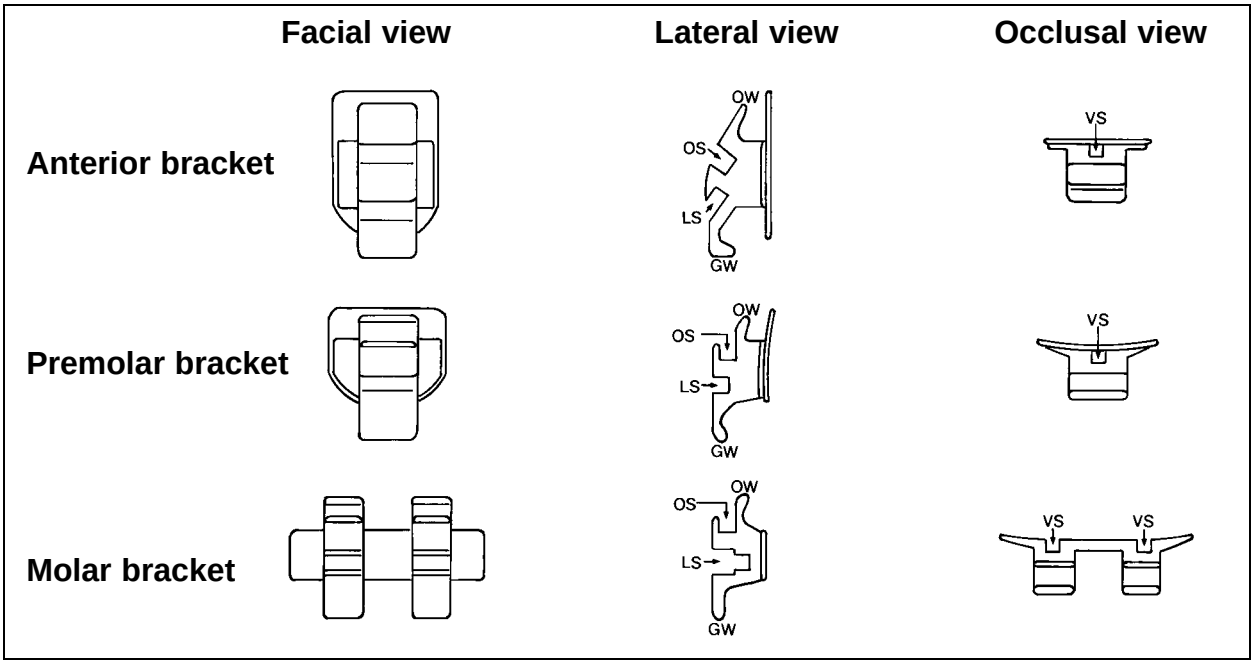

Fig. 1 Fujita lingual brackets (OS = occlusal slot; LS = lingual slot; VS = vertical slot; OW = occlusal wing; GW = gingival wing).

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double-over ligation technique,[2] but the most efficient method of correcting a rotated tooth in a lingual slot system is with a rotation tie.[3]

Rotation control is more efficient with the occlusal slot, since it requires only the insertion of the light archwire, which produces an action analogous to tipping with a labial edgewise appliance (Fig. 3). A small, flexible archwire

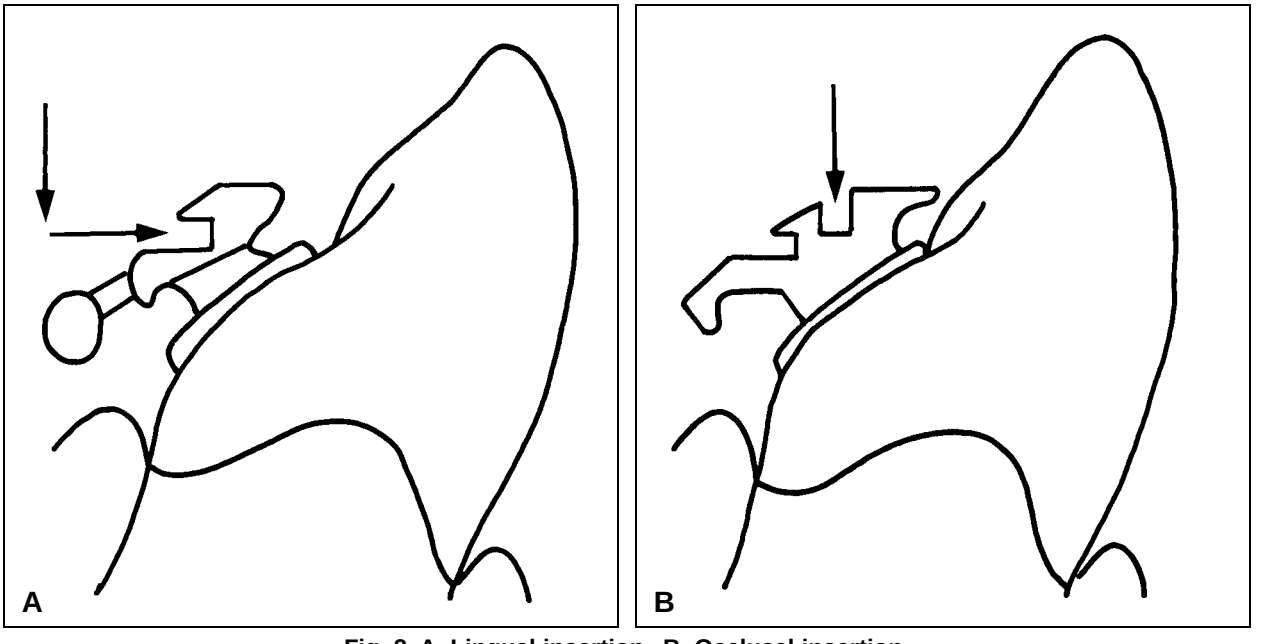

Fig. 2 A. Lingual insertion. B. Occlusal insertion.

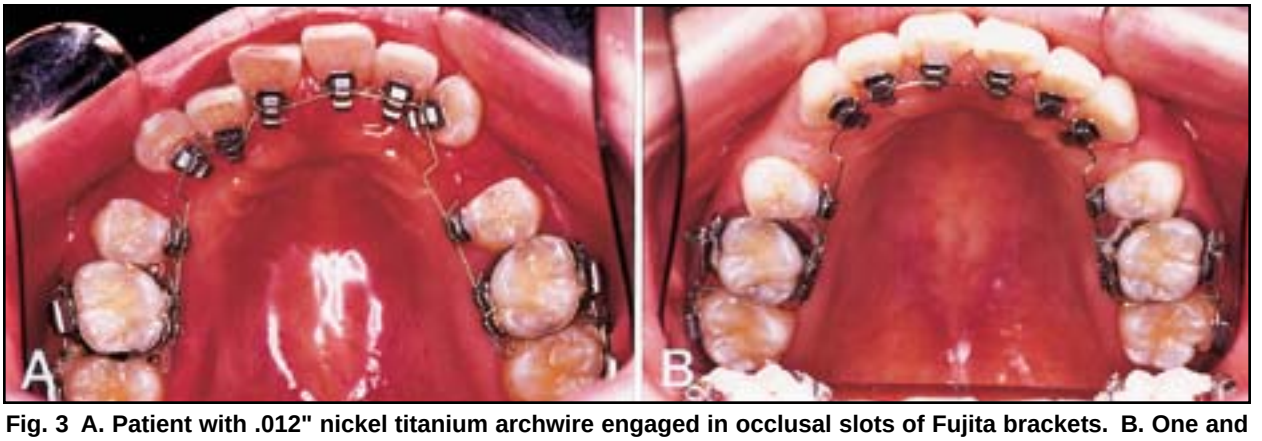

Fig. 3 A. Patient with .012" nickel titanium archwire engaged in occlusal slots of Fujita brackets. B. One and a half months later.

Fig. 4 Partial canine retraction with elastic thread (arrows) on .016" stainless steel archwire in lingual slots of Fujita brackets. Omega-loop stops are bent flush against maxillary first molar brackets.

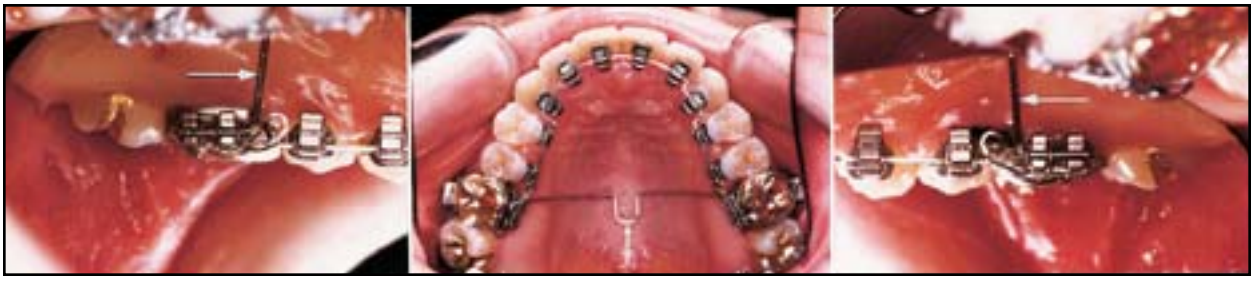

Fig. 5 After maxillary expansion, .028" stainless steel transpalatal arch (arrows) engaged in outer lingual slots of maxillary first molar brackets to retain expansion.

provides excellent rotation control, without the need for elastomeric chains. Once the archwire is engaged in the occlusal slot, however, 1st-order bends are required for additional rotational changes.

The .018" × .018" lingual slot is generally reserved for sliding mechanics such as partial canine retraction (Fig. 4) and various tandem archwire systems. The molar bracket has .028" × .022" outer and .018" × .018" inner lingual slots ("slot in slot"). The outer slot of the maxillary molar bracket can engage a transpalatal arch to retain an expanded maxillary arch (Fig. 5) or to inhibit extrusion of the maxillary first molar during leveling in dolichofacial patients.

The .016" × .016" vertical slot permits the insertion of auxiliary uprighting springs or elastic hooks on one or more teeth at any time during treatment (Figs. 6,7). In our experience with lingual appliances, occlusally and lingually opening slots are not effective in controlling tip, probably because of the reduced bracket width. Uprighting springs in the vertical slots provide optimal tip control of individual teeth (Fig. 6). In addition, the archwire does not need to be removed for placement of auxiliaries.

Tandem Archwires

To overcome the undesirable forces produced by continuous light wires in uneven bracket slots, both the occlusal and lingual slots can be used for tandem archwires in the same arch, with appropriate auxiliaries (Fig. 8). Applications include maintenance of archform during alignment, inhibition of tipping at extraction sites during space closure, and axial alignments such as uprighting and paralleling. Tandem systems can be also used in space closure and final detailing.

Discussion

Torque control is the same for both labial and lingual systems, because torque play is a

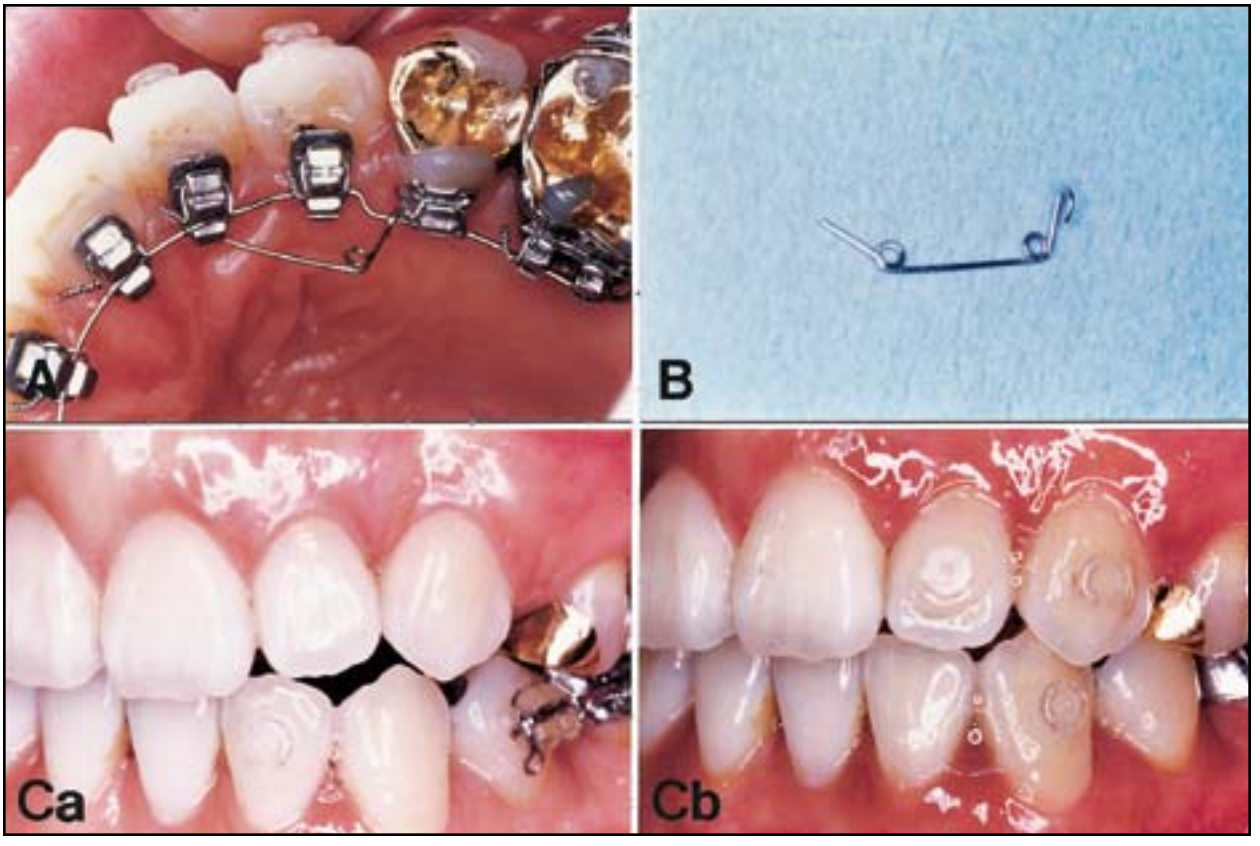

Fig. 6 A. Uprighting spring in vertical slot of maxillary left lateral incisor bracket. B. Uprighting spring made of .014" stainless steel wire. C. Correction of distally tipped maxillary left lateral incisor by uprighting spring. a. After appliance placement. b. Four months later.

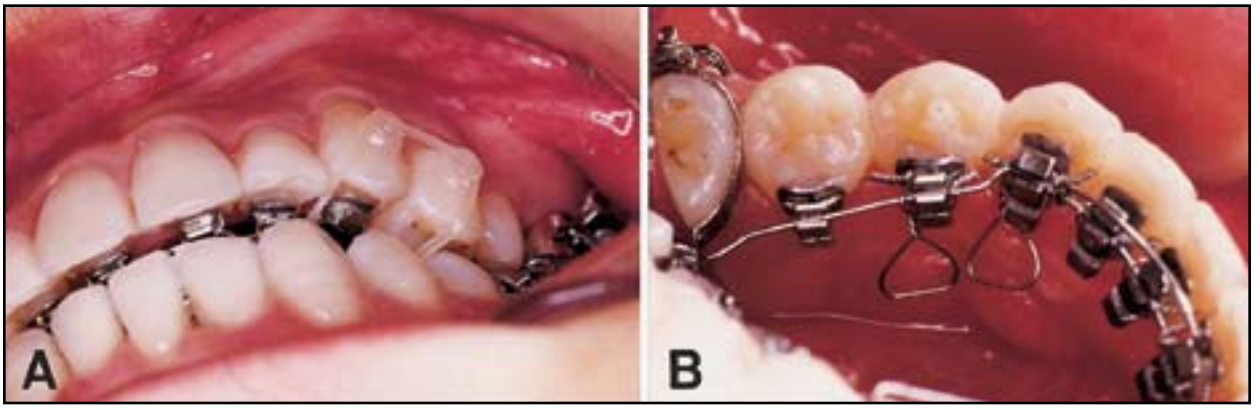

Fig. 7 A. Plastic buttons for attachment of cross-elastic on maxillary left canine and first premolar. B. Delta hooks, made of .012" stainless steel ligature wire, inserted in vertical slots of mandibular left canine and first premolar brackets to guide cross-elastic toward gingival tie wings.

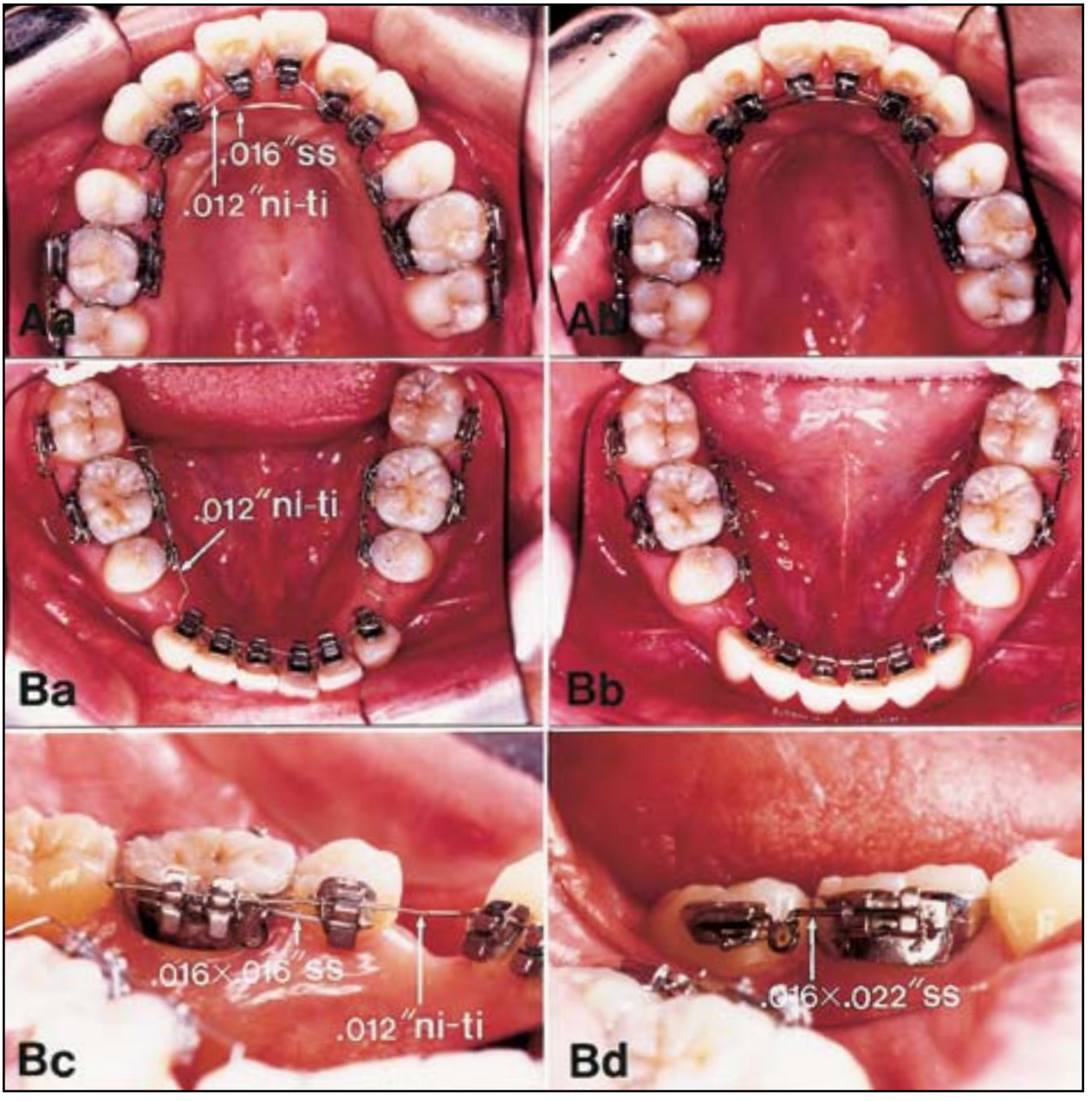

Fig. 8 Various tandem archwire systems. A. Tandem system for maintaining archform while correcting protrusive maxillary central incisors: flexible .012" nickel titanium segment in anterior occlusal slots; rigid .016" stainless steel stabilizing wire in lingual slots. a. After appliance placement. b. One and a half months later. B. Tandem system for maintaining horizontal position of posterior teeth during alignment: flexible .012" nickel titanium continuous archwire in occlusal slots for aligning teeth and correcting asymmetrical archform; rigid .016" × .016" stainless steel segments in lingual slots of second premolars and first molars, and rigid .016" × .022" stainless steel sectional wires placed buccally on first and second molars. a. Before alignment. b. After alignment. c. Lingual view. d. Buccal view (continued on next page).

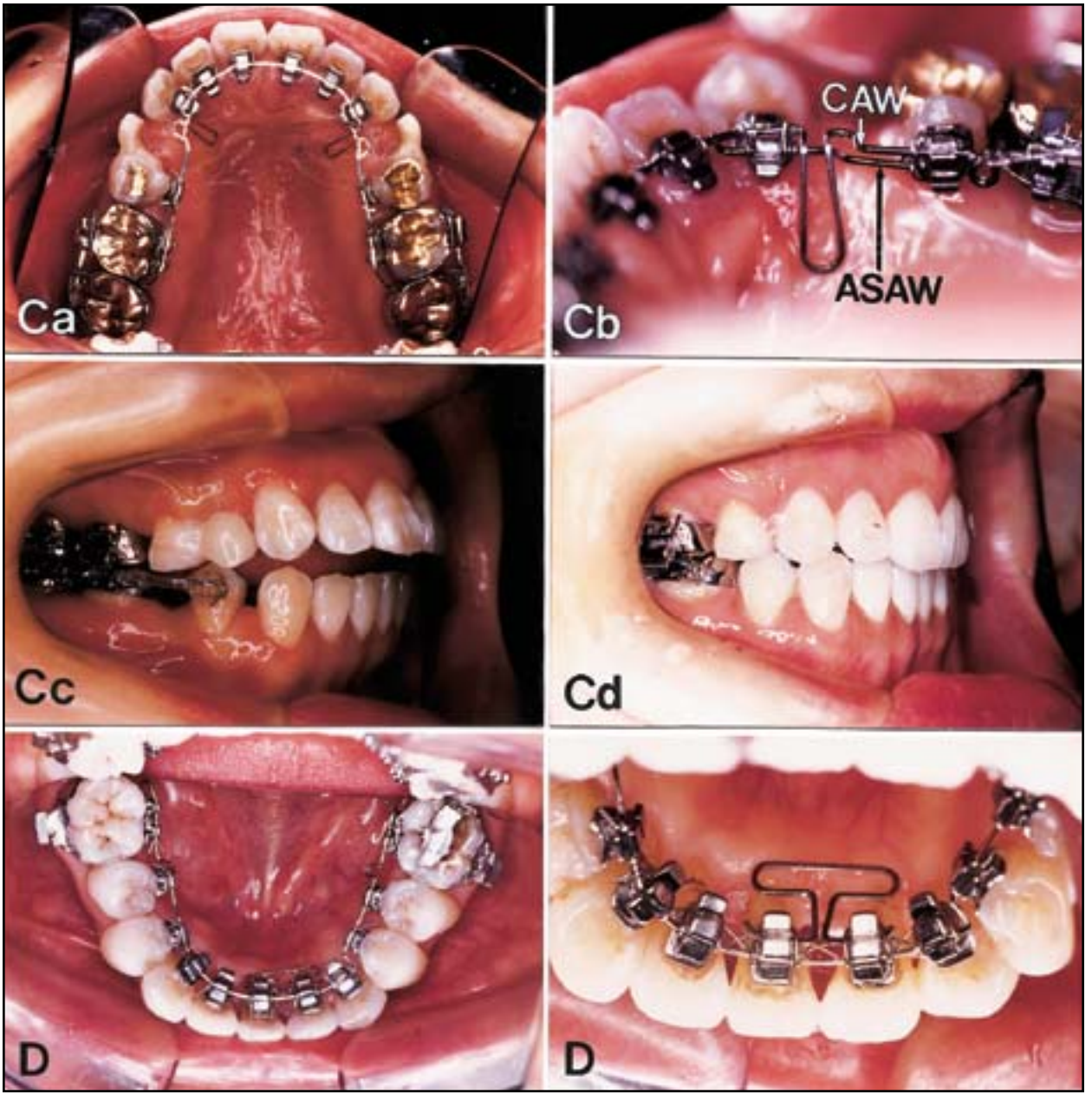

Fig. 8 (cont.) C. Tandem system for inhibition of tipping at extraction sites during space closure: .018" × .018" stainless steel closing archwire (CAW) in occlusal slots for space closure; .016" × .016" anti-tipping segmental archwires (ASAW) in lingual slots of canines and second premolars. a. Occlusal view. b. Lingual view. c. Before space closure. d. After space closure. Note good angulation of teeth at extraction site. D. Tandem system for paralleling teeth at extraction site after space closure: .018" stainless steel base archwire in occlusal slots; .016" × .016" stainless steel T-loop in lingual slots of mandibular right central and left lateral incisors.

function of the size of the rectangular archwire relative to the size of the archwire slot; the width of the bracket is not a factor.[4] For adequate tip and rotation control, a labial bracket must be at least .1" wide.[4] Three-dimensional control of crown and root positions is more difficult with a lingual bracket, which must be as narrow as possible mesiodistally.[1,4-6]

The multiple slots of the Fujita lingual bracket allow positive tip and rotation control for a wide variety of mechanics, despite the reduced bracket width. Occlusally opening slots are effective in controlling rotations, and vertical slots are useful for mesiodistal root control of individual teeth with uprighting springs. Lingual slots allow even more treatment possibilities through the use of tandem archwires.

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