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Time: A New Orthodontic Philosophy

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Although the SPEED bracket was introduced by Hanson in 1980,1,2 interest in "self-ligating" bracket sy recently reached a peak.3-12 Another early bracket, the Mobil-lock, works effectively but is bulkier than brackets. More recent twin bracket mechanisms–"A" Company's Activa and Damon SL and systems un American Orthodontics, and Ormco–are more streamlined.

The Time bracket, the first one-piece self-ligating system, was developed over a period of three years us computer technology (Fig. 1). This article will describe its major features.

Archwire Changes

Reduced chairtime for archwire changes has been cited as a key advantage of self-ligating systems over brackets.4 Maijer and Smith found the average time for an archwire change to be 10.1 minutes with conv 2.8 minutes with self-ligating brackets.5

The Time bracket can be opened either with a dental probe or with its own special opening instrument (F can easily be mastered with a little training and practice.

A hole machined in the spring clip places the probe in the correct location. The spring clip opens far eno inserted, but the opening is limited by a stop between the clip and the bracket body. Resistance will be fe opening is reached; opening the clip any farther could deform it enough that it would have to be replaced

If necessary, the spring clip can be removed by over-opening it or by sliding it mesially or distally. This to be used with conventional ligatures. It is possible to replace a spring clip in the mouth, but practically should be removed first.

The Time bracket is closed by inserting the same instrument into the hole in the spring clip and rotating t closed position.

Archwire Friction

The relatively high friction of conventional preadjusted brackets makes it difficult to control the force re movement.10-27 The magnitude of the force depends on the diameter of the wire and the direction of pu force of 1.17 Newtons is needed to pull an .014" round nickel titanium wire, parallel to the slot, through Company bracket, compared to .01N for a Time bracket and .01N for a Damon SL bracket.11 An .019" wire took 2.25N of force with the conventional bracket, .75N with the Time bracket, and .07N with the D

With smaller wires, there is essentially no difference between passive, tubelike self-ligating brackets suc Damon SL and active self-ligating brackets such as SPEED and Time. The Time spring clip is stopped b from the bracket base (Fig. 1). For wire sizes up to .018", therefore, it acts like a convertible tube. The S is .016" from the bracket. With lesser diameters, there is no contact between the archwire and the spring greatly reduced.

The force delivered by a spring clip to the archwire is 250-350g, depending on the width of the clip. Wh exceeds .018", in the case of Time brackets, the force of the clip will produce friction. Thus, the brackets friction with the smaller wires used for leveling, retraction, or molar distalization, and torque control wit later in treatment.

It is not necessary to engage a full-size wire to achieve the desired torque, because the spring clip presses bottom and walls of the bracket slot (Fig. 3). Therefore, torque control can be achieved much earlier in tr other bracket systems.28,29 An .018" X .025" or .019" X .025" stainless steel archwire provides the same wire in an .022" slot. Time creates the torque; the torque does not need to be added to the archwire.

Bracket Profile and Height

One-piece machining allows a significant reduction in bracket profile and height, making the Time brack to conventional brackets. This helps minimize occlusal interference,30 which is especially critical in the Combined with an absence of ligatures, elastics, and hooks, it also improves patient comfort and oral hyg

The reduced profile required a concomitant reduction in the bracket's in-out values (Table 1). Ormco reso with its Bios bracket system by developing a new archform and reducing the in-out of the mandibular in Our goal was to keep the shape of the widely popular Tru-Arch form and to reduce the in-out values of a allow the lowest possible profile.

Although mesh bases are the most common, they have to be assembled from at least four parts: foil mesh and bracket body (Fig. 4). Each part has to be thick enough to withstand the forces applied to the bracket in the bracket body between the corner of the slot and the base. With a one-piece bracket, this distance is width of the pad. It seemed to us that the Time bracket therefore had more potential for in-out reduction bracket would. The problem became how to calculate the in-out values for the Tru-Arch form, which wa Andrews preadjusted brackets with mesh bases.33

Copies of upper and lower Tru-Arch forms were scanned and converted to computer graphics. Each arch the duplicate archform was overlaid and then pushed slightly distally to represent the reduced in-out of th (Figs. 5A, 5B). The distance between the two arches was measured using Autocad 12 software.

The most critical tooth for in-out is the mandibular second bicuspid, with -22° of torque (Fig. 4). Therefo limit for the Time system was calculated from this bracket. The in-out reduction of .14mm for the second minor, but it allowed a reduction of .5mm for the mandibular central incisor (Table 1). This one-third rec resulted in a one-third reduction in the prominence of the central incisor bracket.

Time brackets were also designed to incorporate torque-in-base, which is considered essential for exact b placement.33,34

Rotation Control

The Time spring clip produces a light, continuous force for correction of rotated teeth. If the spring clip i overcorrection is possible with elastics or conventional brackets. Another way to achieve overcorrection Time bracket in an unusual position. This can keep a rotated tooth overcorrected throughout treatment (F

Debonding Strength

The Time bracket base has microetched mechanical undercuts (Fig. 7). Several studies have found mecha inferior to mesh bases in terms of debonding strength.35-38 In 1983, Diedrich and Dickmeiss found that had 26% greater debonding strength (8.7N/mm^2) than the Unitek Dyna-Lock mechanical base (6.9N/m

The Ormco mesh base appeared to strike a good balance between mesh size and wire diameter. The ques whether the original Adenta base, which was similar to the Dyna-Lock base, had an optimal configuratio undercuts. By using a theoretical mathematical model, we were able to improve the debonding strength c from 7.1N/mm^2 to 8.2N/mm^2–similar to the value found by Diedrich for the Ormco mesh base.

Anatomical Design

Bracket placement is critical to achieving the desired treatment results. The Crown placement system, wl with Time and Crown brackets, makes bracket location easier (Fig. 8). The outline of the bracket pad fol distal secants from the cementoenamel junction to the incisal edge, and the contour lines of the bracket p gingival line and the incisal edges.

Case Report

A 13-year-old male presented with a Class II, division 1 malocclusion (Fig. 9). As in all my cases, the ca a SAM 2 articulator, and the cephalometric analysis was made with the CADIAS computer program.

The patient showed crowding in both arches and a mesofacial Class I skeletal pattern. Analysis revealed and inclination of the maxillary incisor and excessive inclination of the mandibular incisor.

The treatment plan was to extract the maxillary first bicuspids, the left mandibular first bicuspid, and the second bicuspid. The second bicuspid was selected because the Class II malocclusion was more severe o bar would provide moderate anchorage, and .022" Time brackets would be used.

Treatment began with .0175" superelastic nickel titanium archwires, which were followed six weeks late nickel titanium archwires and full-time Class II elastics. After another two and a half months, the cuspids distally enough that elastic wear could be reduced to 10 hours a day.

The maxillary archwire was then replaced with an .016" X .022" nickel titanium wire, and a palatal bar v stabilize the maxillary molars. Six weeks later, a maxillary .016" X .022" closing-loop archwire and a ma stainless steel archwire were placed. In another two weeks, the mandibular archwire was replaced with a closing-loop wire.

After two more months, the mandibular second molars were bonded, and an .016" round reverse-curve n archwire was inserted. This was replaced six weeks later by an .016" X .022" reverse-curve nickel titaniu months later, the mandibular left second molar was banded due to bracket failure, and the archwire was c X .025" reverse-curve nickel titanium wire (Fig. 10).

Fixed appliances were removed after nearly 16 months of total treatment time (Fig. 11).

The post-treatment cephalogram showed that the anchorage achieved was much more than would norma largest maxillary archwire used was the .016" X .022" closing-loop wire, which has 27.4° of play in an .(maxillary central incisor brackets have 12° of torque. Therefore, only the interactive spring clip could ac maintenance of maxillary central incisor torque during the retraction of the anterior segment.

This torque control was also responsible for an undesirable reduction in A point. However, enlargements taken before treatment and after bracket removal showed dense bone in the area of the central incisor ape increased maxillary anchorage (Fig. 12).

Conclusion

Early in treatment, when smaller wires are in place, the low friction of the Time brackets permits lighter moving teeth. Unwanted rotations do not occur during retraction, because the spring clips and light force tendencies. Additional benefits of light forces include less root resorption and less stress on the TMJ fror wear.

Early torque control from the interactive spring clips allows treatment to be finished sooner. The Crown makes bonding easier and more accurate, and the spring clips make archwire changes faster. Taken toget the Time system mean shorter treatment time and reduced chairtime. □

ACKNOWLEDGMENTS: The author is very grateful to Dipl. Ing. Claus Schendell for his inspiring tea in developing the Time bracket. My special thanks to Dr. Kent Floreani (Sault Ste. Marie, Ontario) for re the manuscript.

FIGURES

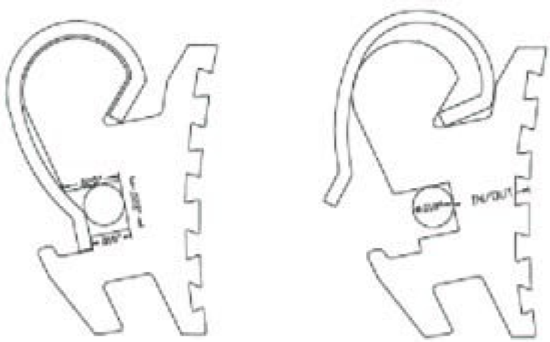

Fig. 1 Schematic drawing of Time bracket.

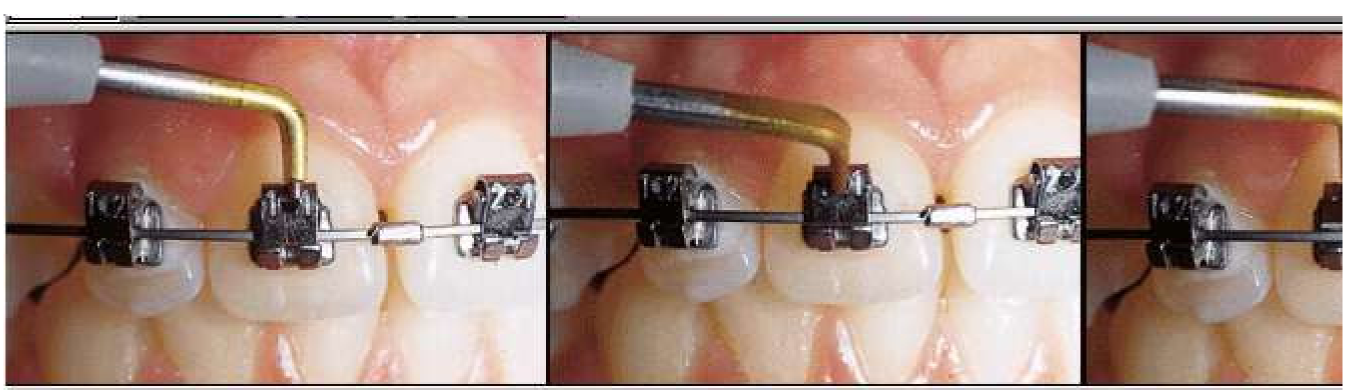

Fig. 2 Opening spring clip with special Time instrument.

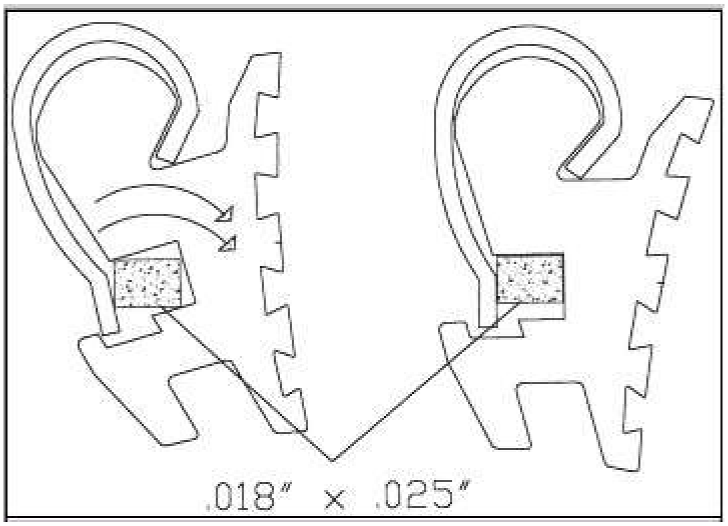

Fig. 3 Closing spring clip seats .018" x .025" archwire against slot walls, producing full torque control.

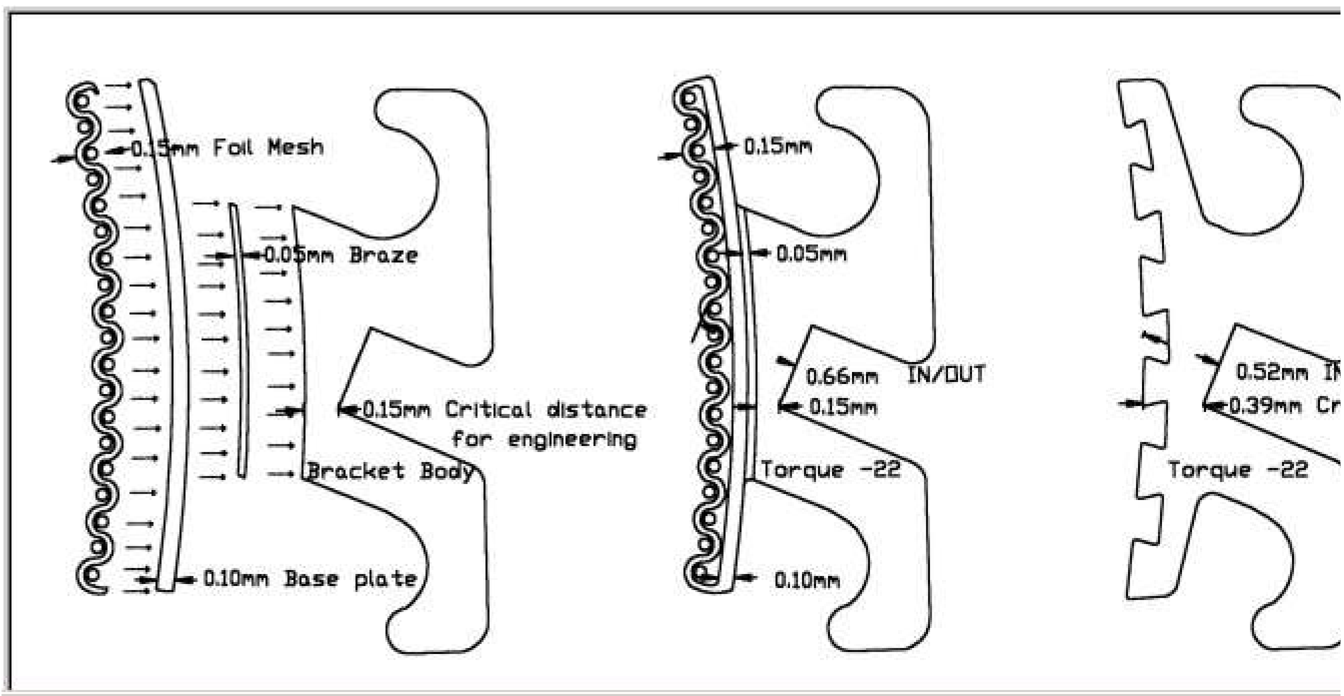

Fig. 4 Dimensions of mandibular second bicuspid bracket with conventional mesh base compared to mar
bicuspid Time bracket (right).

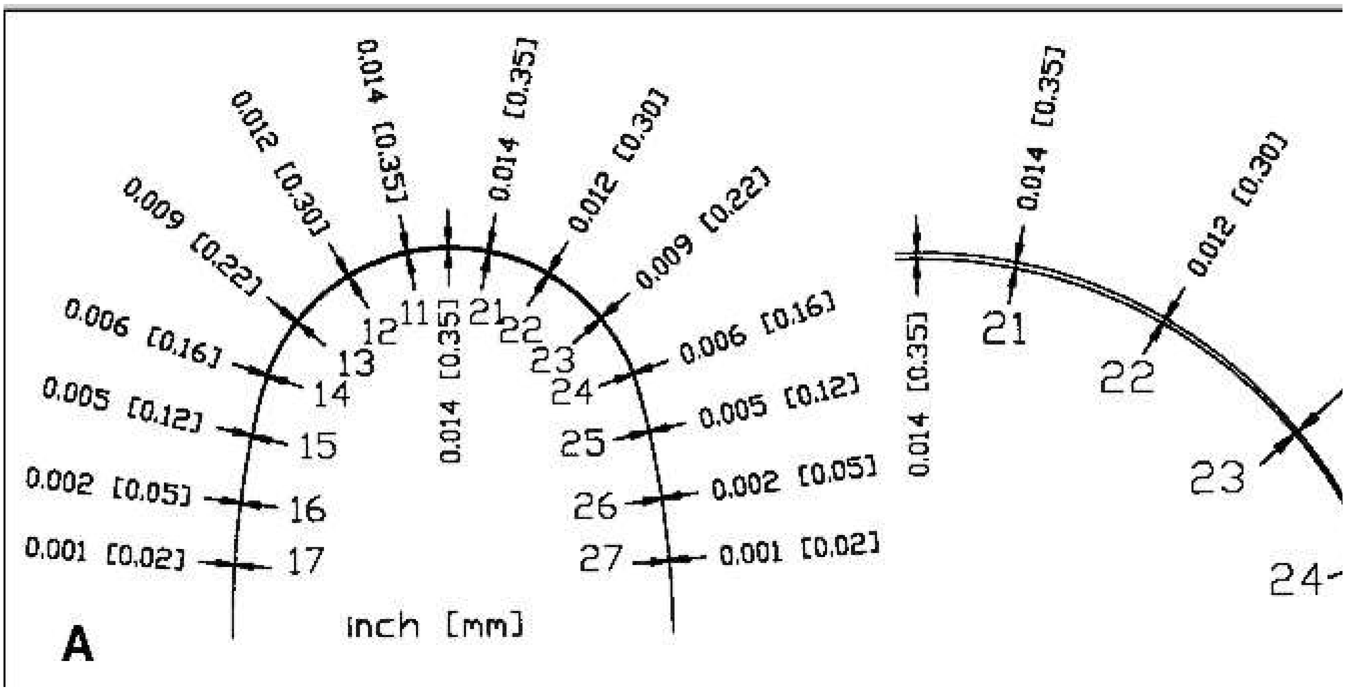

Fig. 5A Computer measurement of distances between Tru-Arch form with in-out of conventional "A" Co
bracket (above) and Tru-Arch form with in-out of Time brackets (below). A. Maxillary arch. B. Mandibu

Fig. 6 A. Patient with rotated maxillary right lateral incisor at start of treatment with Time brackets. B. T
lateral incisor bracket rebonded in unusual position to achieve overcorrection. C. After eight more month

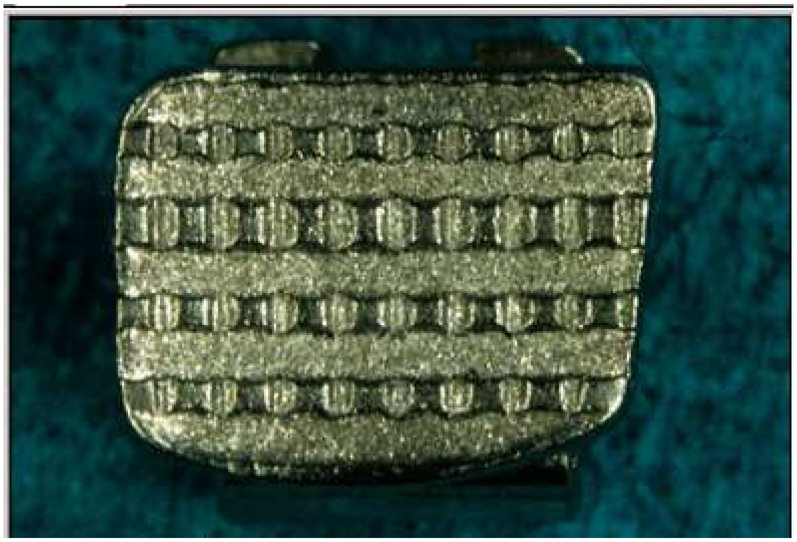

Fig. 7 Microetched mechanical undercuts on Time bracket base.

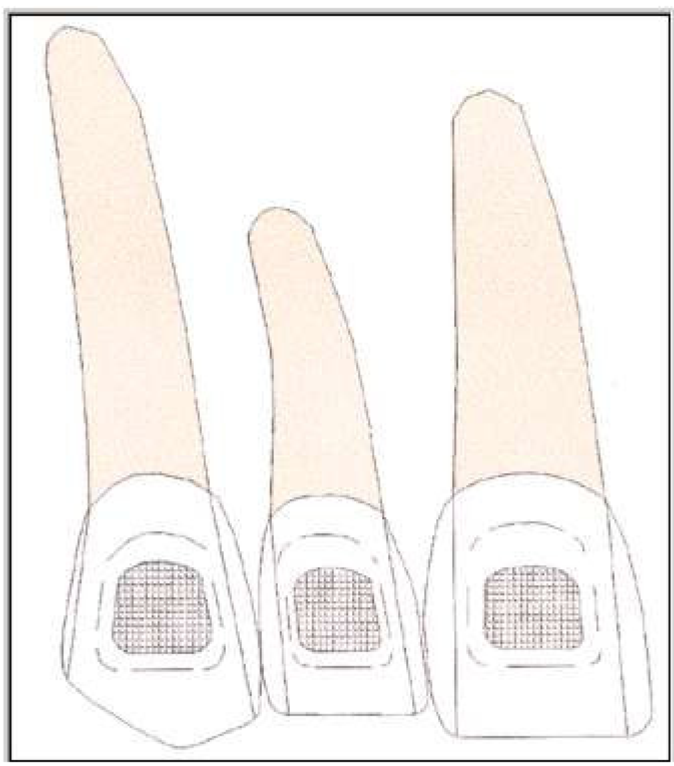

Fig. 8 Crown bracket placement system.

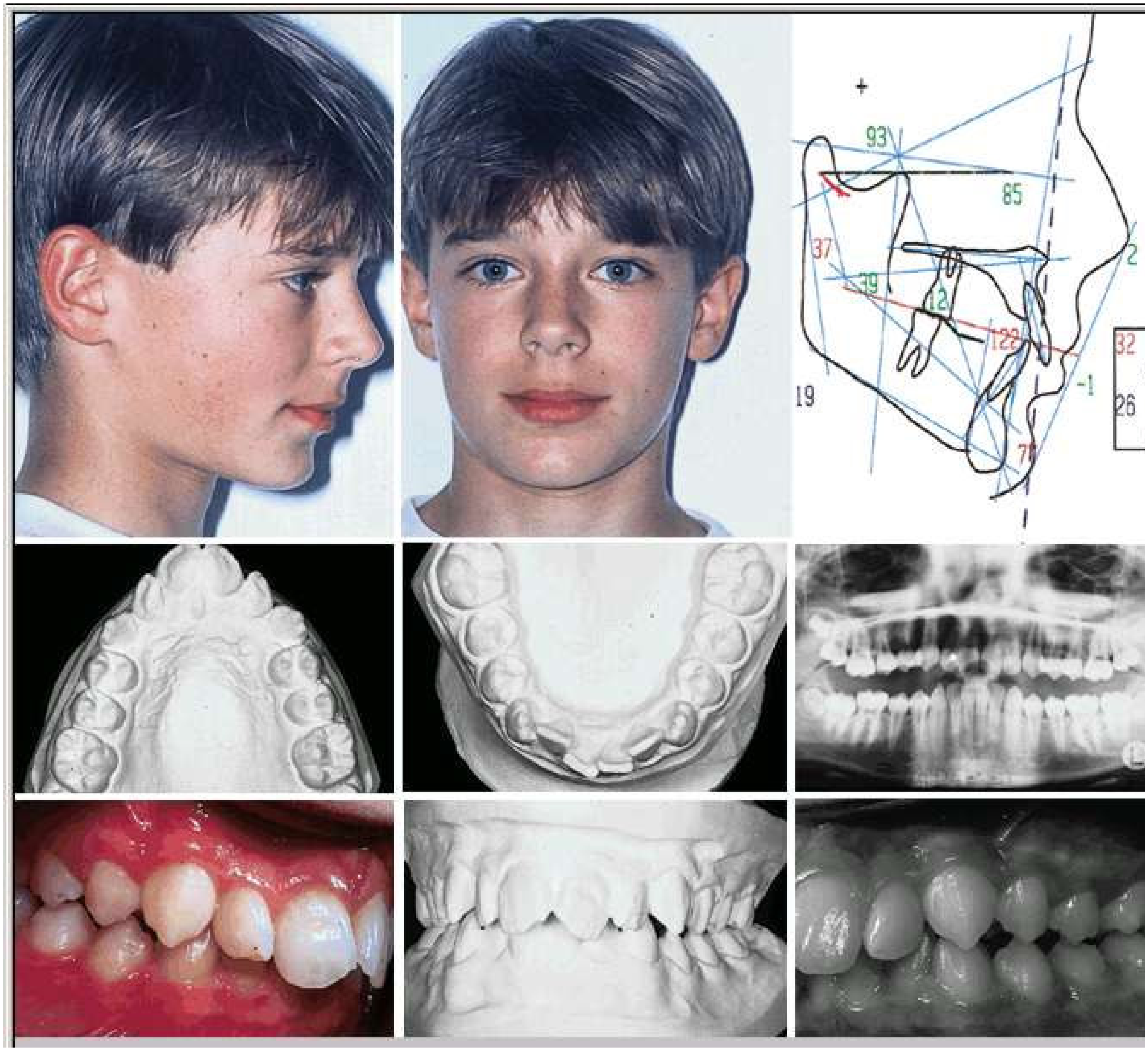

Fig. 9 13-year-old male Class II, division 1 patient before treatment.

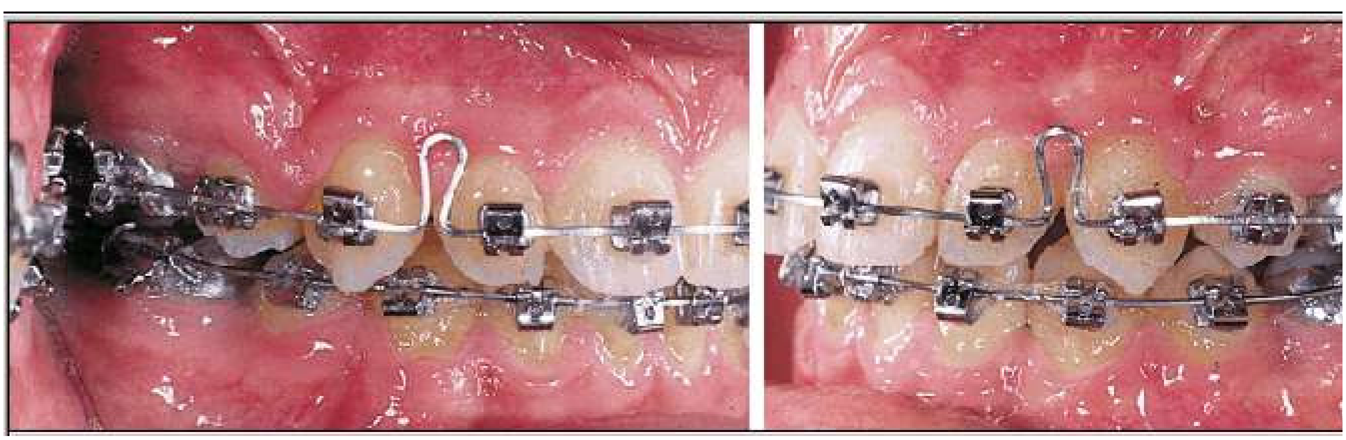

Fig. 10 Finishing with maxillary .016" x .022" stainless steel closing-loop archwire and mandibular .017 curve nickel titanium archwire.

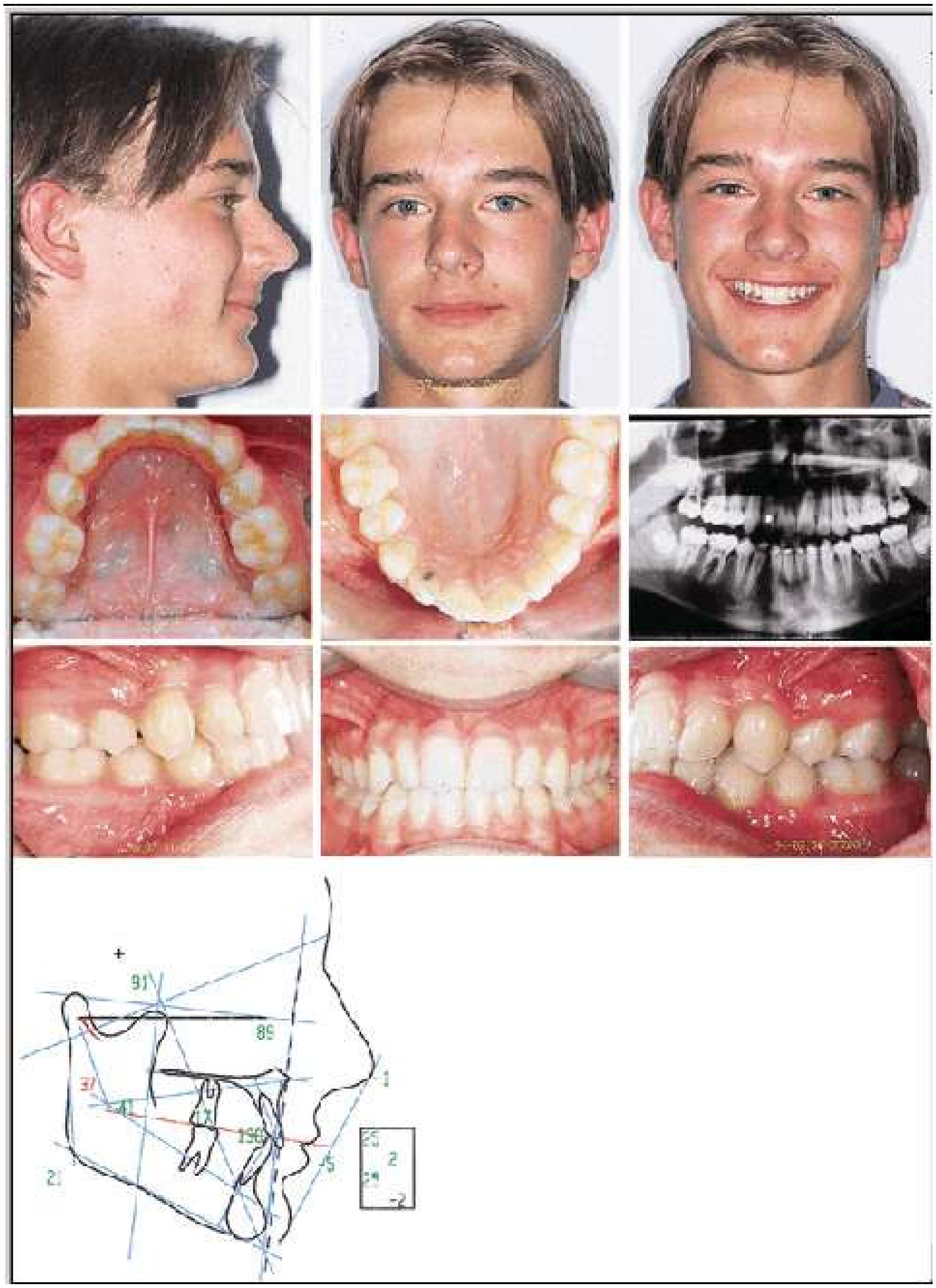

Fig. 11 After nearly 16 months of total treatment.

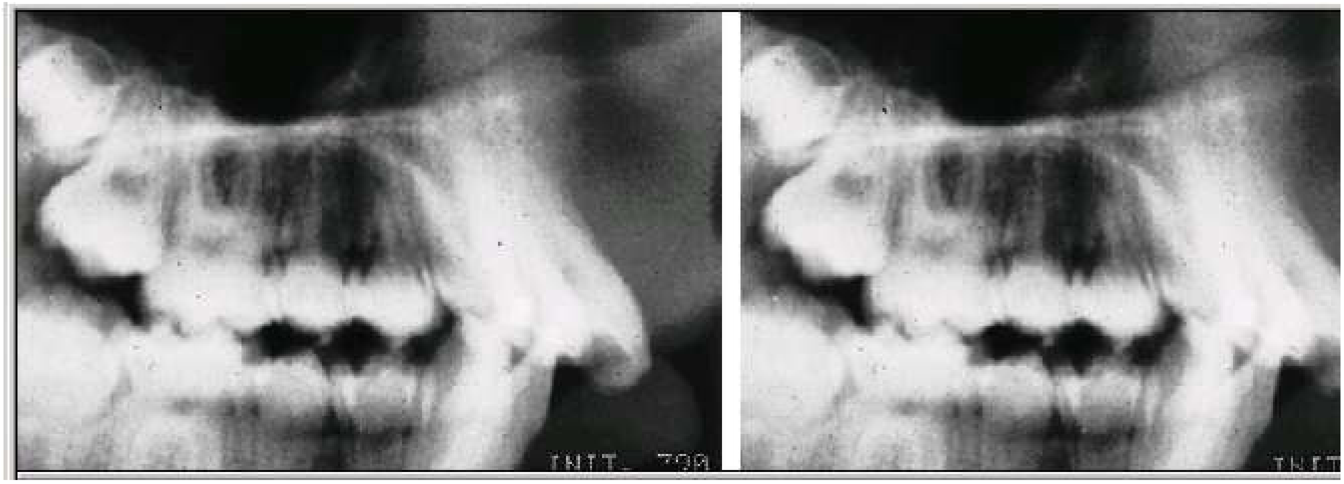

Fig. 12 Detail of lateral cephalograms taken before treatment and after bracket removal, showing dense b
incisor apex.

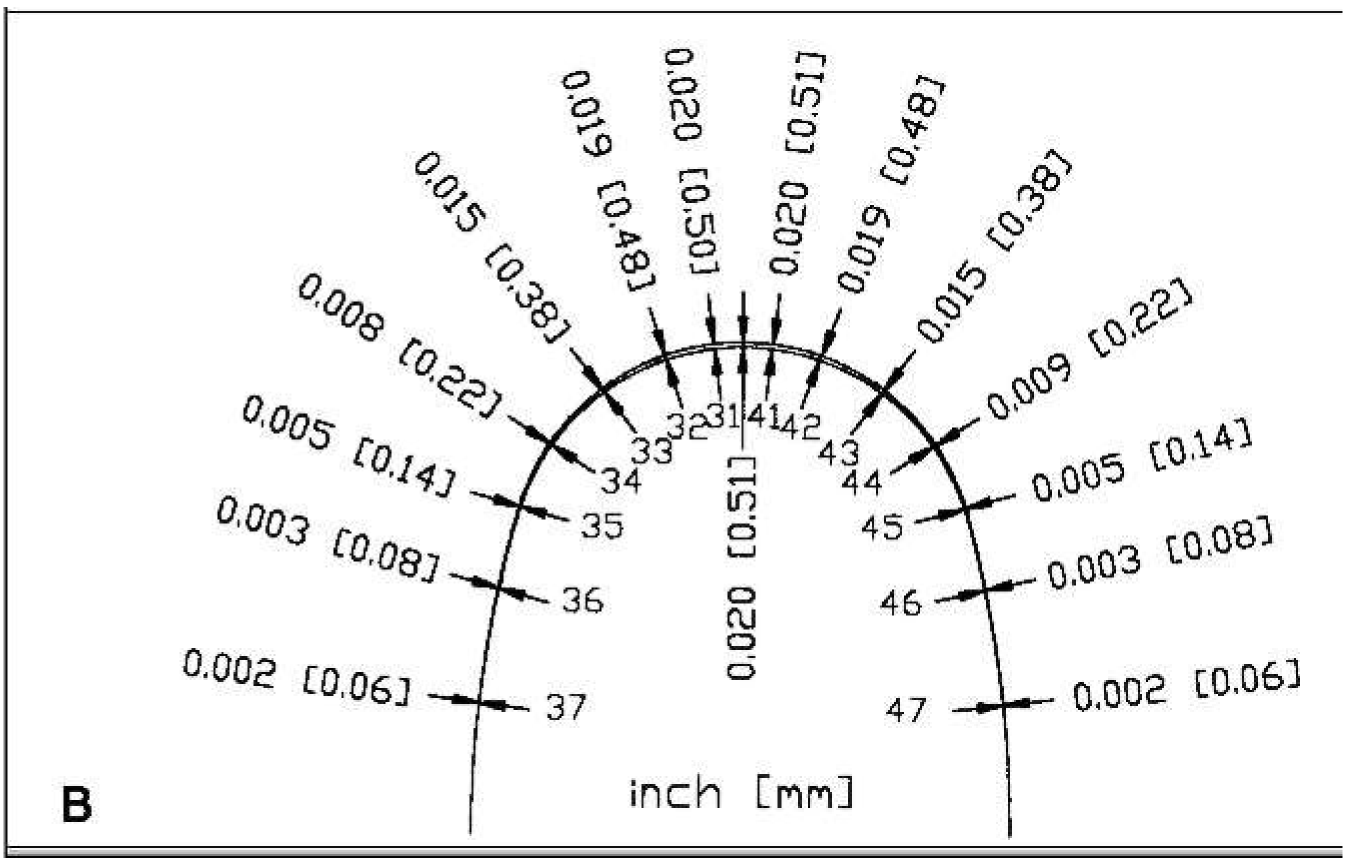

Fig. 5B Computer measurement of distances between Tru-Arch form with in-out of conventional "A" Co
bracket (above) and Tru-Arch form with in-out of Time brackets (below). A. Maxillary arch. B. Mandibu

TABLES

TABLE 1
REDUCTIONS IN IN-OUT DISTANCES (MM)

	Right Central Incisor	Right Lateral Incisor	Right Cuspid	Right First Bicuspid	Right Second Bicuspid
Maxillary Arch					
"A" Company	1.19	1.45	0.84	0.84	0.84
Reduction	–0.35	–0.30	–0.22	–0.16	–0.12
Time	0.84	1.15	0.62	0.68	0.72
Mandibular Arch					
"A" Company	1.55	1.55	0.94	0.76	0.66
Reduction	–0.50	–0.50	–0.38	–0.22	–0.14
Time	1.05	1.05	0.56	0.54	0.52

Table. 1

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FOOTNOTES

1 SPEED: Strite Industries Ltd., 298 Shepherd Ave., Cambridge, Ontario, N3C 1V1 Canada.

2 Mobil-lock: Forestadent USA, 10240 Bach Blvd., St. Louis, MO 63132.

3 Activa, Damon SL, Tru-Arch: Registered trademarks of "A" Company Orthodontics, 9900 Old Grove 92131.

4 American Orthodontics, 1714 Cambridge Ave., Sheboygan, WI 53082.

5 Bios: Ormco, 1717 W. Collins Ave., Orange, CA 92667.

6 TIME, Crown: Registered trademarks of Adenta GmbH, P.O. Box 82199, Gutenbergstr. 9, D-82205 G Germany. Distributed by American Orthodontics.

7 DynaLock: 3M Unitek, 2724 S. Peck Road, Monrovia, CA 91016.

8 SAM 2: Great Lakes Orthodontics, Ltd., 199 Fire Tower Drive, Tonawanda, NY 14150.

9 CADIAS: GAMMA GmbH, Widerhoferplatz 4, A-1090 Vienna, Austria.