APPLIANCE UPDATES — Q'S & A'S — CASE REPORTS — TECHNIQUE TIPS — REVIEWS

DR. PETER KESLING AND DR. BRUCE SCAROLA, PRESIDENT OF ORTHODONTIC EDUCATION AND RESEARCH FOUNDATION. SEE PAGE 4.

TIP-EDGE TODAY™

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DRS. TOM ROCKE AND JAIME ITO ARAI, PRESIDENT MEXICAN ACADEMY OF ORTHODONTICS, DURING FIRST TIP-EDGE COURSE IN MEXICO.

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EDGELINES

PARKHOUSE MOVES INTO THE THIRD DIMENSION

Study sheds light on torque forces delivered by uprighting springs. Cover story.

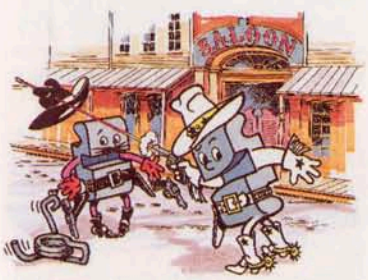
DUAL AUXILIARIES ARE TORQUE FRIENDLY

Light, continuous torque forces prove ideal for ceramic brackets. Page 3.

WHY *DID* ANGLE STOP EXTRACTING?

Appliance limitations may have swung E.H. Angle toward nonextraction. Page 4.

TIP-EDGE GRAPHIC



Tippy and his pet Side-Winder disarm another "edgy" bandit. No longer will his excess friction rob a patient in any "stage."

THE THIRD DIMENSION
Testing Side-Winders For Torque

By: R. C. Parkhouse, BDS, FDS, D.Orth RCS – Wales

The Side-Winder spring was designed to correct the tip in "Tip-Edge" and is well proven. It can claim to be more efficient than the traditional uprighting spring, because the power coil of the Side-Winder is concentric rather than gingival to the center of rotation. This also has the advantage that the arm does not travel perceptibly along the archwire during the uprighting process, thus reducing friction and eliminating the possibility of contact with an obstruction, such as an intermaxillary hook or another spring arm. The Side-Winder is also hygienic and relatively esthetic, although it does add slightly to the labial profile of the appliance.

The versatile Side-Winder can power both tip and torque when used with a rectangular archwire in stage three. Regular readers of TIP-EDGE TODAY will recall how each tooth is individually tipped and torqued to its self limited, three-dimensional finished prescription.[1-2] The method has a reverse counterpart in conventional straight wire appliances, in which progressive increases in rectangular archwire sizes cause a similar progression in torque uptake, but with increasing stiffness.

Continuous light forces with no activation peaks should be the aim of every orthodontic force system. This is another example of just how little pressure is necessary to torque teeth. The root torquing movement (as opposed to mesial or distal tipping) is produced by the Side-Winder pressing the flat bracket surfaces against a flat, passive archwire platform only .028" wide (Figure 1).

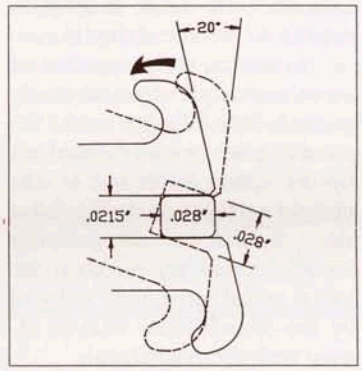


Figure 1. The Tip-Edge archwire slot (which may increase to as much as .028") reduces as the tooth uprights mesiodistally under the power of a Side-Winder uprighting spring. As the slot faces press against the passive edgewise archwire, the tooth can be torqued (arrow) as much as 20 degrees.

The jig illustrated (Figure 2) was set to measure torque at up to 6 mm of apical displacement of a maxillary canine, mounted on a short section of .0215" x .028" archwire, using a variety of springs. All Side-Winders were inserted from the occlusal and uprighting springs from the gingival, as in clinical practice. The pressure differential measured across the range is exaggerated by the difficulty of matching the curved path of apical movement with the arc traveled by the arm of the strain gauge. There is also the difficulty of adopting standard activation for comparison purposes be-

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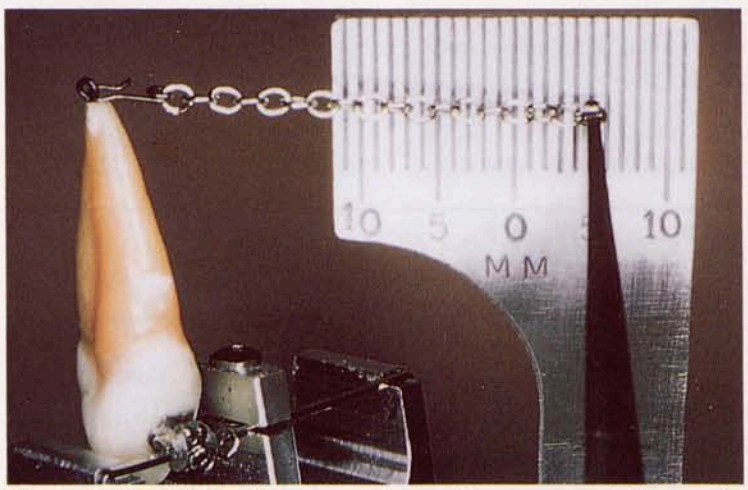


Figure 2. Jig designed to measure torque forces generated by mesiodistal uprighting springs working against a passive section of rectangular archwire material.

THE THIRD DIMENSION Cont. from Pg. 1

tween springs of different designs. Activation was therefore as supplied "out of the packet" for all except the final Side-Winder trial.

As can be seen from the results (Figure 3), any uprighting spring can exert a torquing action when used in conjunction with a rectangular base archwire. Because all designs of springs employ a lever arm and hook labial to the archwire, the slight elevation or depression of the bracket face relative to the edges of the rectangular archwire will add or subtract very slightly from the torque produced. This depends on which direction the root is being torqued. The difference is so small that it is often inside the limits of experimental error and has not been observed clinically.

However, a Side-Winder, inserted from the occlusal, torques roots labially slightly more efficiently than palatally. Conversely, a conventional uprighting spring or (Mini Spring) which inserts from the gingival, will perform a little stronger to the palatal than to the labial.

It will be seen that the behavior of all springs is broadly similar and that the ultra high tensile archwires perform relatively better in the smaller sizes, a Mini Spring in .010" Supreme wire doing valiant battle against a standard Side-Winder in .014" Special Plus. Nevertheless a stiffer Side-Winder in .014" Premium Plus, employing only a single coil, has proved less reliable in clinical trial than ordinary Side-Winders. It lacks resilience and inevitably loses some activation when the hook is lifted to engage it over the archwire.

Spring Type	Direction of Root Torque	Millimeters of Apical Deflection 1	2	3	4	5	6
Standard Side-Winder .014" Special Plus	Palatal	10	11.5	14	17	19.5	22.5
	Labial	11	12	14.5	17	20	24
Mini Spring .010" Supreme	Palatal	10	12	14	16	17.5	21.5
	Labial	9.5	11	13	15	16.5	20
Begg type uprighting spring .012" Premium Plus	Palatal	12	13.5	14	17.5	22	27
	Labial	10	11.5	14.5	18.5	22	27.5
Single Coil Side-Winder .014" Premium Plus*	Palatal	13	15.5	17	21.5	25	29.5
	Labial	13.5	15.5	17.5	21.5	26	30
Double Coil Side-Winder .014" Premium Plus*	Palatal	15	17.5	18.5	22.5	25.5	28.5
	Labial	15.5	17	20	24	28	33
Standard Side-Winder "Hyperactivated"	Palatal	13.5	15	17.5	22	26	32
	Labial	15.5	17	19	24	31	36

* *Not commercially available*

Figure 3. Torque forces generated at apex of maxillary canine by mesiodistal uprighting springs acting against passive .0215" x .028" stainless steel archwire through the Tip-Edge archwire slot.

In action, the proportion of tip versus torque varies inversely as each Side-Winder works toward its goal – a goal defined not by the spring itself but by the uprighting faces of theTip-Edge slot. Except in very palatally inclined maxillary incisors, the initial apical movement induced by the Side-Winder will be almost entirely mesiodistal.

As the tipping correction nears completion, so the torque effect increases progressively, until the final action is almost all torque, hardly any tip. The final 6 degrees of torque may be achieved through only 1 degree of tip. An apex requiring both tip and torque therefore describes a curved path to its final destination with a gradual reduction in pressure, since the torque force delivered is always less than that for tip. This raises the question as to whether a stronger spring might be appropriate for the final stages of stage three.

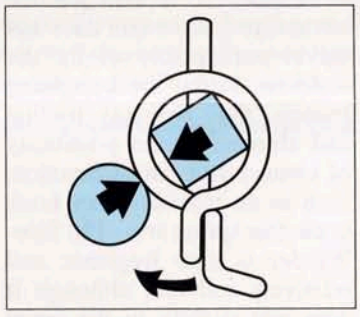


Figure 4. Counterclockwise Side-Winder is hyperactivated with squeeze of plier.

The simplest compromise when nearing the very end of uprighting, in order to expedite full torque delivery, is to overactivate a standard Side-Winder. However, the design of the spring would appear to prevent this, since the leg of the spring passes occlusal to the coils in order to protect them. Attempts to twist the coils further open are therefore prevented by the lever arm making contact with the leg. An effective way around this problem is to remove the Side-Winder in order to slide the square beak of a spring forming plier as far through the coils as it will comfortably go. Give the plier a good squeeze and Eureka – a "hyperactive" Side-Winder! (Figure 4) The effective activation stored up in the coils will now exceed 90 degrees. The same activation proved less dramatic when applied to a similar spring in Premium Plus wire, probably due to reduced resilience.

Meanwhile the most meaningful testing arena of them all remains in the mouth. We need to be asking ourselves the basic question of where we should be heading as the orthodontic world wakens increasingly to the possibility of ultra light forces. Clinical observation with Tip-Edge so far suggests that Side-Winder torquing of incisors against passive rectangular base archwires is generally completed before final apical distalization of the canines. Even making allowances for differences in root area, the comparison is surprising, considering that the torque forces delivered by the Side-Winder are so much lighter than the tipping forces.

Might it be, therefore, that we should be looking to reduce our tip forces rather than increasing torque pressures? Only time will tell.

References

[1]Parkhouse RC. Out torquing conventional edgewise mechanics, 1993; Spring, Tip-Edge Today.

[2]Kesling, PC. Tip-Edge Guide, 2nd Ed. 1992, Two Swan Advertising, pp. TE-27-28.

Q's and A's

Q. Several orthodontists are asking us when/if Tip-Edge brackets with .018" slots will be available.

REINOR—BLOEMFONTAIN, SOUTH AFRICA

A. Tip-Edge brackets with .018" archwire slots would be a giant step backwards. This would prohibit the use of any archwires (round or rectangular) larger than .018" and result in a tremendous reduction in vertical and horizontal control during the space closing and torquing phases of treatment. It would then be necessary to resort to high pull headgear and/or palatal bars to counteract the reciprocal forces from elastics (intermaxillary and horizontal) and torquing or uprighting auxiliaries. Archwires and slots of .018" are the result of orthodontists trying to "tame" the violent action and excessive forces created between archwires and conventional, static archwire slots.

With Tip-Edge the slot itself solves the problem. It permits the passive engagement of a .022" round or .0215" x .028" rectangular archwire in every bracket – even though some or all teeth may be tipped distally and/or lingually.

The forces for uprighting and torquing are generated by .014" round steel and/or nickel titanium auxiliaries. Such forces are far lighter and more continuous than ever possible from archwires in .018" slots. The .022" archwire remains relatively undisturbed functioning solely as a retainer and stabilizer.

Dual Torque With Individual Root Torquing Auxiliaries

Individual Root Torquing Auxiliaries (IRTA's) are the most efficient, as well as esthetic, means of torquing individual teeth with edgewise appliances (Figure 1). They can also be used to torque both central incisors simultaneously as is often required during stage three. To accomplish this, dual IRTA's are used side by side on both maxillary central incisors.

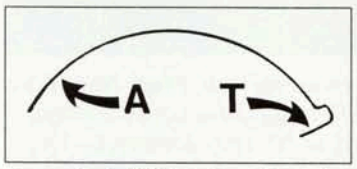


Figure 1. Individual Root Torquing Auxiliary formed from .016" round wire lies in one plane. Activation arm A; Torquing leg T.

To deliver palatal root torquing forces the short torquing legs of the auxiliaries are inserted from the incisal through the vertical slots of the central incisor brackets. The longer activation arms of the auxiliaries are then directed distally and temporarily engaged into the archwire slots of the first or second premolars to lock the auxiliaries in place prior to engaging the main archwire (Figure 2). When using any type of torquing auxiliary, the main archwire should be fabricated from the stiffest, largest diameter wire possible to counteract all reciprocal forces produced.

With both Individual Root Torquing Auxiliaries temporarily engaged, the main archwire is tied in directly over the arms of the auxiliaries. The ligature ties initially placed to hold the arms of the auxiliary in place on the premolars are removed and both the auxiliary and main archwire ligated in the slots together. Once fully engaged the ends of the legs protruding through the vertical slots can either be cut flush or bent (Figure 3).

With Tip-Edge archwire slots the long activation arms of the auxiliaries should be directed distally to keep the central incisors upright – if they are engaged mesially they could tip the roots of the central incisors mesially.

Figure 2. Dual IRTA's are inserted from the incisal into the vertical slots of the central incisor brackets. Their arms are temporarily ligated into the archwire slots on either the first or second premolars before the main archwire is engaged.

Figure 3. Main archwire and auxiliaries fully engaged, torque forces are delivered without compromising esthetics. IRTA's eliminate potential for ceramic bracket fracture as seen when torquing by flexing rectangular archwires.

When using conventional edgewise brackets or Deep Groove Tip-Edge brackets with the caps removed, the activation arms can be engaged under the main archwire to either the mesial or distal. The edgewise archwire slots will prevent any tipping. Of course, if the activation arms were directed mesially they would cross over one another at the midline.

Although the use of dual IRTA's only delivers torquing forces to the central incisors, this is usually adequate to complete nonextraction, second premolar or first molar extraction treatment. These auxiliaries are extremely effective providing two degrees of torque per month on average without reactivation. Dual IRTA'S can also be used to augment braking mechanics when desired during stage two.

Since ceramic Tip-Edge brackets* do not offer the Deep Groove feature on incisor brackets, the use of dual IRTA's is an ideal means of torquing the anterior teeth without compromising esthetics. The light continuous forces delivered by Individual Root Torquing Auxiliaries also eliminate the potential for bracket fracture that can occur when trying to deliver active torquing forces to ceramic brackets from rectangular archwires.

*Not yet commercially available.

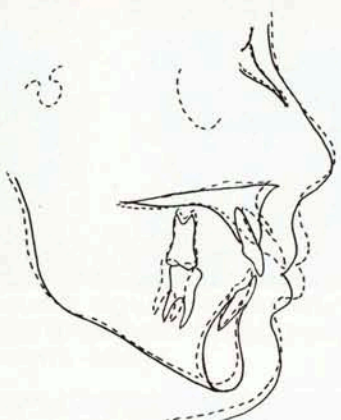
CASE REPORT

A 13-year old female exhibited a Class II Division 1 malocclusion with 10 mm of overjet. The maxillary arch was constricted resulting in a mandibular shift to the right and a posterior crossbite. Four first premolars were extracted. Treatment followed with Tip-Edge brackets and the Differential Straight-Arch® Technique.

Initial archwires of .016" Wilcock wire and mild anchor bends. Note elastic from mandibular canine to molar. Lingually displaced lateral is tied to the archwire with elastomeric tie. Light (1.5 oz) Class II elastics.

Beginning of Stage II with .022" round archwires. Tip-Edge archwire slots permit canines and lateral incisors to tip distally with no deepening of the bite. E-Link is closing maxillary extraction site.

Round .022" archwires provide stability during final uprighting and torquing phase of treatment. Nickel titanium Torque Bar lies lingual to main archwire in maxillary central and lateral Deep Groove slots. Side-Winder springs upright teeth mesiodistally.



KS. ..... Female, 13 Years
Class II, Division I
Extractions U44, L44
Archwires Used 4 (2U, 2L)
Adjustments ..... 12, **Time**: 19 Months
Retention ..... Tooth Positioner, Mandibular 3-to-3

Cephalometric Changes:

	Start - Dotted	Finish-Solid
1-APo	+0.5 mm	+1.0 mm
Wits	0.0 mm	+2.0 mm
SN-MP	41.0°	42.0°
ANB	4.5°	5.5°
SNA	76.5°	78.0°
SNB	72.0°	72.5°
1-SN	108.0°	94.0°

P.C. Kesling Proposes That Appliance Limitations May Have Driven Angle To Nonextraction Position

On February 14th Dr. Peter C. Kesling received the prestigious Merit Award from the Orthodontic Education and Research Foundation in St. Louis. During his lecture that followed he proposed that Dr. E.H. Angle's nonextraction position may have been due to appliance limitations.

During his first twenty years of teaching, Angle advocated extractions when necessary, usually first premolars. However, he had no means of uprighting the canines after they were tipped into the extraction site. His rival, (both professionally and commercially) Dr. Calvin Case, invented an appliance to both tip crowns and upright roots. In 1907 Angle gave Case credit but also switched to a nonextraction policy that would not require such major tooth movements which he claimed were "unnecessary in most cases."

Angle then began his quest for the ideal nonextraction appliance which ended in 1925 with the edgewise bracket. Kesling pointed out that this mechanism, like Angle's first traction screws of 1886, was mechanically flawed. Both, in effect, turn the very teeth to be moved into anchor teeth. Angle corrected his traction screw in 1887 by permitting the tooth to tip. He died in 1930 evidently oblivious to the severe limitations to tooth movement created by his horizontal edgewise slot – which, in effect, acts like a molar tube.

Dr. Kesling then explained the development of the Tip-Edge archwire slot – the thought behind it and its dynamic action. He demonstrated with treated cases that second order bends, extraoral force, palatal bars, and/or segmented arches are not necessary to treat even the most severe malocclusions when the teeth are free to tip to their new positions.

Tip-Edge In Australia

A 2-day Tip-Edge course was given in Adelaide, South Australia in conjunction with the September 1993 14th Australian Orthodontic Congress. The course was presented to 63 orthodontists by Drs. Thomas Rocke and Richard Parkhouse. Drs. Craig Dreyer, Wayne Sampson, Andrew Toms and Milton Sims comprised the organizing committee.

The course was deemed a great success with many participants anxious to begin using Tip-Edge in their private practices and respective university graduate programs.

Dr. Parkhouse was also a featured speaker at the Congress. His paper, "Evolution in Bracketry: From Straight-Wire to Tip-Edge," was well received and earned him an invitation to speak at the AAO meeting in San Francisco in May, 1995.

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