Letters to the editor*

Case reports display the finest type of orthodontics

As an orthodontist retired from private practice and university teaching, I enjoy reading the monthly journal to help me stay in the game and be better able to interact with colleagues and former students. I especially enjoy the case reports section, as I can relate to the very practical side of these articles. Two case reports in the June issue, "A novel approach of torque control for maxillary displaced incisors"[1] and "A simple approach to correct ectopic eruption of maxillary canines"[2] were some all-time favorites. These cases are sourced from practitioners and schools around the world and exemplify some of the best attributes of the enlightened orthodontist (I considered "renaissance", but that would be too old-school). The treatments devised and displayed in these cases represent creativity and ingenuity bolstered by a sound knowledge of biological and mechanical principles. These qualities were integrated by each practitioner and team member to formulate and execute a novel and simple treatment approach to complex problems unique to each patient. To those who are wary of the future of orthodontics, concerned about corporate, systematized, do-it-yourself, and teleorthodontics, look to these cases and the untold numbers like them being treated across the world as the finest type of orthodontics, destined to thrive and prosper.

Lawrence R. Voss
Chicago, Ill

Am J Orthod Dentofacial Orthop 2019;156:435
0889-5406/$36.00

http://dx.doi.org/10.1016/j.ajodo.2019.06.012

REFERENCES

1. Jiang Q, Yang R, Mei L, Ma Q, Wu T, Li H. A novel approach of torque control for maxillary displaced incisors. Am J Orthod Dentofacial Orthop 2019;155:860-70.
2. Ferreira JB, Silveira GS, Mucha JN. A simple approach to correct ectopic eruption of maxillary canines. Am J Orthod Dentofacial Orthop 2019;155:871-80.

*The viewpoints expressed are solely those of the author(s) and do not reflect those of the editor(s), publisher(s), or Association.

What seems to be the latest will never replace the need to apply sound biomechanics

I read with interest the case report by Jiang et al in the June 2019 issue (Jiang Q, Yang R, Mei L, Ma Q, Wu T, Li H. A novel approach of torque control for maxillary displaced incisors. Am J Orthod Dentofac Orthop 2019;155:860-70). The treatment presentation of the patient with palatally blocked incisors was extensive and accurate. However, I wish to express some concerns pertaining to the comparison of the effectiveness of the promoted torquing technique vis-à-vis traditional mechanics.

The authors reported that the required opposite torque on the maxillary incisors could not be achieved with conventional torque management techniques such as Warren springs and torque bends or with the use of inverted brackets. Clinically effective and efficient torque control in the maxillary anterior teeth was achieved instead using a simple approach by bonding a second row of brackets cervically on the compromised teeth and engaging nickel-titanium archwires.

Preadjusted orthodontic brackets have in-built prescriptions of torque, tip, and in-out that are optimized for average patients. Maxillary incisor bracket torque prescriptions vary between 0° and 22°, with bracket placement at the center of the crown.

Torque expression may be influenced by other factors as well. The labial contour of the crown surface differs at different heights on the crown of the same tooth. Placement of the same bracket at different heights will result in important differences in the amount of root torque because of variable labial crown morphology and a varying crown-root angle.[1]

In a finite element study, Papageorgiou et al[2] found that palatal crown displacement was significantly affected by bracket positioning in the apical third of the crown (up to 94%), in teeth with average crown-root angle. On the other hand, buccal apex displacement was affected both by bracket prescription (up to 42%) and bracket positioning (up to 23%).

The bonding of upper brackets gingivally to protect or enhance the smile arc was introduced by Pitts,[3] and it is referred to as "SAP bracket positioning." It can lower the effective torque prescription. Palatal crown torque can be controlled even more by inverting all anterior

maxillary incisor brackets by 180° and using 0.017 × 0.025-inch wires in 0.022 × 0.026-inch slots.[4]

Control of the discussed different torque issues in the anterior maxilla could have been accomplished using this technique with the addition of an inverted ipsilateral bracket on the right lateral incisor. Bonding a second row of brackets with a sectional archwire for torque application seems to be superfluous.

Furthermore, the treatment sequences shown give rise to particular questions on the treatment mechanics. The authors report that they had used an archwire/Warren spring combination in an inverted bracket on the proclined right lateral incisor for torque correction but achieved no satisfactory results. The clinical photographs show an inverted contralateral (left) bracket bonded to the maxillary right lateral incisor. A full-size archwire/Warren spring combination on the lateral right incisor seems to be engaged in the 0.018-inch bracket slots. The corresponding cone beam computed tomography imaging shows an overlap of the root apex of the maxillary right central and lateral incisors.

When individual teeth have roots that are not upright under their crowns, available variable torque options may help to achieve the required root torque. In more demanding cases, reverse torque can be employed by inverting the bracket to change the torque value from positive to negative or vice versa. As a ground rule, brackets bonded for reverse torque have to be kept on the same side of the arch to maintain the same mesio-distal root tip (Fig).[5]

In the case discussed, an inverted contralateral bracket was bonded on the right lateral incisor. Because of the increase in tip, the root of the right lateral incisor was tipped further mesial. As a consequence, the root apex was trapped behind the root apex of the right central incisor, thereby impairing the application of palatal crown torque.

In addition, the incorporated effective torque of inverted brackets may depend on the chosen bracket prescription. For instance, an inverted Roth lateral incisor bracket will deliver an increased inclination of 16° (from 8° palatal root torque to −8°).

Placing maxillary incisor brackets gingivally has been already discussed by Pitts.[3,4] This will work well for teeth requiring palatal crown torque.[2] Further variable torque goals can be accomplished by using brackets with different torque values simultaneously or by inverting an ipsilateral bracket on a single tooth in the same arch.

Unfortunately, high forces may be generated in the bracket slots using this approach, and reciprocal torque is produced especially when using preadjusted brackets.

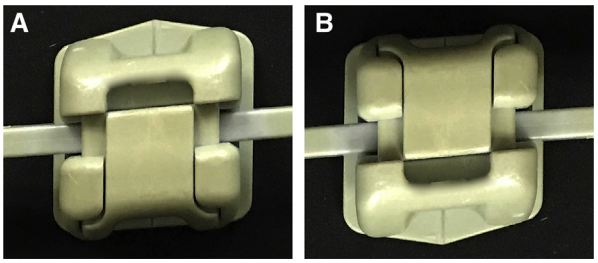

Fig. A, When inverting a maxillary left central bracket with 5° of distal root tip in the same side of the arch; **B,** the distal root tip remains the same.[5]

Furthermore, adjacent teeth are subjected to unnecessary back-and-forth torque action.[6,7]

Because reciprocal torque to adjacent teeth may not always be beneficial, the use of auxiliary springs for torquing a single tooth may be the preferred solution. Warren spring auxiliaries can torque the maxillary central and lateral incisors independently.[7] When an archwire/Warren spring combination for palatal crown torque is used with a full-size archwire, the spring is bent to push against the incisal part of the crown, but no torque movement will occur because the edgewise wire will twist to produce lingual root torque, making this application impossible.[8] However, placing this auxiliary on a round or undersized wire renders this mechanism possible.[8] Wires adjusted to torque individual teeth should be sufficiently undersized to allow the wire to rotate in the slot of the adjacent tooth with no reciprocal torque action on that tooth. This precaution is more easily observed with a 0.022-inch slot compared with a 0.018-inch bracket slot.[9]

De Angelis and Davidovitch have pointed out that the 0.016 × 0.022-inch archwire/Warren spring combination is advantageous, because the adjacent teeth do not undergo reverse torque. In a 0.022 × 0.028-inch slot the archwire has 27.4 degrees of freedom. As the Warren spring exerts its torquing force, the archwire moves in the opposite direction, but because sufficient intra-bracket tolerance exists, the archwire does not inadvertently torque the adjacent teeth.[9]

In the case discussed, an undersized β-titanium 0.016 × 0.022-inch archwire/Warren spring combination for palatal crown torque in inverted 0.022-inch slots of passive self-ligating brackets kept on the same side and bonded gingivally in the anterior maxilla would suit all biomechanical requirements for applying sound palatal crown torque to the right lateral incisor and will lower the effective torque prescription on the other incisors.

It can be concluded that excellent treatment results can be achieved with "old school" conventional torquing appliances in the anterior maxilla when tooth anatomy and the characteristics of the orthodontic appliance are sufficiently considered during torque application.

Ulrich Kritzler
Warendorf, Germany

Am J Orthod Dentofacial Orthop 2019;156:435-7
0889-5406/$36.00

http://dx.doi.org/10.1016/j.ajodo.2019.07.003

REFERENCES

1. van Loenen M, Degrieck J, De Pauw G, Dermaut L. Anterior tooth morphology and its effect on torque. Eur J Orthod 2005;27:258-62.
2. Papageorgiou SN, Sifakakis I, Keilig L, Patcas R, Affolter S, Eliades T, et al. Torque differences according to tooth morphology and bracket placement: a finite element study. Eur J Orthod 2017;39:411-8.
3. Pitts TR. Begin with the end in mind and finish with beauty. Eur J Clin Orthod 2014;2:39-46.
4. Pitts TR. Bracket positioning for smile arc protection. J Clin Orthod 2017;51:142-56.
5. Kozlowski J. Honing Damon system mechanics for the ultimate in efficiency and excellence. Clin Impressions 2008;16:23-8.
6. Thickett E, Taylor NG, Hodge T. Choosing a pre-adjusted orthodontic appliance prescription for anterior teeth. J Orthod 2007;34:95-100.
7. Jayade V, Annigeri S, Jayade C, Thawani P. Biomechanics of torque from twisted rectangular archwires. A finite element investigation. Angle Orthod 2007;77:214-20.
8. Burstone CJ, Choy K. The biomechanical foundation of clinical orthodontics. Chicago: Quintessence Publishing; 2015. p. 8.
9. De Angelis V, Davidovitch Z. Variation in torque expression in preadjusted appliances. Am J Orthod Dentofac Orthop 2004;126:20.

Authors' response

Thank you for your comments on our recent article. We agree with your opinion on the value of traditional biomechanics for the management of torque. The purpose of the case report was to provide clinicians with a simple, yet effective alternative, rather than replacing or lowering the usefulness of traditional torquing techniques, because managing torque control in a patient requires opposite torques on the adjacent teeth using special treatment biomechanics.

The conventional torque controls, including torque bend on stainless steel wire, and the use of Warren springs and inverted brackets, were not really satisfactory in that case. The radiographs showed that the maxillary right central incisor root was clashing with the mesially inclined root of the maxillary right lateral incisor. Treatment using an upper removable appliance,

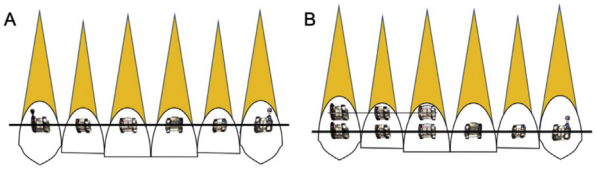

Fig 1. A, All maxillary anterior brackets are positioned gingivally. **B,** A twin-brackets–twin-wires system is used for torque control; brackets on other teeth are positioned at normal height.

and the use of a contralateral bracket on the lateral incisor at the beginning of the treatment using fixed appliances, resulted in a mesially inclined root of the maxillary right lateral incisor. After correcting the overlapping root, a simple approach—"twin-brackets–twin-wires" (ie, a second row of brackets bonded cervically on the teeth with an NiTi wire fully engaged)—was used to achieve the opposite torque control on the central incisor and lateral incisor. The correction of root torque was effective and efficient.

In comparison with traditional biomechanics, this twin-brackets–twin-wires approach has some advantages. Because of the differences in the anatomical shape and crown inclination of the maxillary right central incisor and lateral incisor, the gingivally bonded auxiliary twin-brackets–twin-wires, together with the main fixed appliances, can generate a moment for torque correction. Although placing maxillary incisor brackets gingivally has been already discussed by Pitts,[1] bonding a second row of brackets with a sectional archwire for torque management was first introduced in the case report (Fig 1); also, changing the heights of brackets may cause undesired root torque.[2,3]

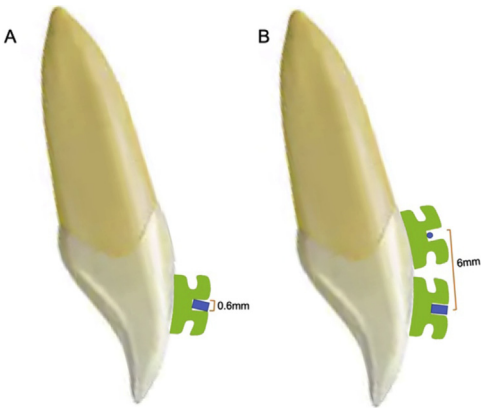

Fig 2. A, The bracket slot is about 0.6 mm in depth. **B,** The twin-brackets–twin-wires approach could lengthen the force arm to about 6 mm.