Torque in Lingual Appliance: A Review

Kartik Hamabhai Hadia
PG Student, Department of Orthodontics, Faculty of Dentistry, Bharati Vidyapeeth Deemed University, Dental College and Hospital, Pune, Maharasta, India

In lingual orthodontic treatment, compelling torque control of the incisors is urgent because of the biomechanical particularities associated with the point of force application and the tight connection between third order deviations and vertical tooth position. It is expressed that the lingual tooth perspective is more complex and versatile and in this way, every change in the bracket position on the lingual side may bring about flighty and broad change in the torque. The historical backdrop of this procedure is peppered by people who have indicated perseverance and creativity; in this article, I will attempt to cover torque consideration in lingual orthodontics.

Keywords: Lingual, Orthodontics, Torque

INTRODUCTION

Torque causes the spot of a shaft, or a wire and torsion is the genuine winding that happens in the material, producing shear strains, and shear stresses as the aftereffect of the torque. Thurow referred orthodontic torque to the buccolingual root tipping, in which movement of the crown is minimized, and movement of the root apex is maximized. Torque expression in lingual appliances is not sufficiently researched. It is expressed that the lingual tooth perspective is more complex and versatile and in this way, every change in the bracket position on the lingual side may bring about flighty and broad change in the torque. The lingual appliance was developed by spearheading exertion of Fujita, Kelly, and Paige. Paige, in 1982, presented a lingual light wire strategy utilizing the unipoint combination bracket (Figure 1) with both the round wire and ribbon arch to complete his cases.

Bracket Design
Bracket design is extraordinarily impacted by the small inter-bracket distance (Figure 2) in the anterior portion on the lingual and by the most noteworthy variety in the anatomy of the lingual surface of teeth.

The bracket utilized are to be slender mesiodistally with little buccolingual profiles to permit incredible inter-bracket distance. Because of narrow bracket, root control is a great deal in the mesiodistal measurement.

The varieties of anatomy on the lingual surface (Figure 3) impact the bracket positioning which influence in-out relationships, torque, and the vertical position of teeth. This is particularly applicable in the pre-torqued, pre-angulated brackets.

The smallest change in bracket position vertically or on a level plane influence the torque values put in the brackets (Figure 4).

With the pre-torqued, pre-angulated, the producer demands that indirect bonding is completed to accomplish the qualities set into the brackets. This is not a necessity with the Begg bracket which can be specifically fortified on the teeth.

The torquing auxiliary (Figure 5) utilized as a part of lingual apparatus is the traditional reverse torquing auxiliary with the forces applied to the incisal edges. This takes into consideration compelling torquing.

According to Takemoto in lingual orthodontic treatment, a standout among the most troublesome issues to overcome has been torque control of the foremost teeth amid space conclusion (Figure 6). According to Hong et al., anterior torque control is accomplished either by straightforwardly applying a moment and force to a lingual bracket or by utilizing lever-arm (LA) mechanics to get the fancied line of activity of the force with respect to the center of resistance.

In the LA framework, the sought tooth movement is achieved by altering the length of the LA and the point of force
Hadia: Torque in Lingual Appliance

Different sorts of dental inserts including micro or miniscrews, miniplates, endosseous implants, and disc-shaped on plants have all been tried for anchorage in orthodontics. Micro or miniscrews have points of interest over miniplates, cylindrical endosseous implants, and labial apparates, the current oral anatomy may counteract perfect position of the LA framework; however, with lingual appliances, the LA framework can simply be in a perfect world found in view of the width and depth of the palate. In this way, lingual LA mechanics can be successful in accomplishing any wanted tooth movement.

![Figure 1: Unipoint combination bracket](image)

![Figure 2: Inter-bracket width is reduced on the lingual](image)

![Figure 3: Great variations in lingual contour of anterior teeth](image)

![Figure 4: Amount of torque will relate to occlusal-gingival placement of lingual bracket](image)

![Figure 5: Use of torquing auxiliary](image)

![Figure 6: The effect of bracket position and location of the point of force application on tooth movement. When the same amount of retraction and intrusion forces is applied to the incisors in labial and lingual systems, the resultant force in the lingual system is pointed further away linguallly from the center of resistance of the incisors compared with the labial system. The net force in the lingual system will produce a larger moment to tip the incisors linguallly than in the labial system. Cc: Center of resistance; F: Retraction force; F: Intrusion force; F: Resultant force; m and M: Moment](image)
disc-shaped on plants in view of the simplicity of selecting legitimate insert destinations, simplicity of insertion in any craved area and capacity to withstand quick constrain stacking. It also causes minimal irritation of oral tissues.

To outline the ideal LA and mini-implant (MI) framework for acquiring the coveted force system during retraction, the point of force application and the line of action of the retraction force are arranged utilizing lateral cephalograms. By altering the length of the LA and the position of the MI, the coveted line of action of the retraction force with respect to the center of resistance of the anterior segment is set up.

The models in Figure 7 show the general response that can be achieved in a normal clinical application.

The right plan of the LA and MI framework is picked after watchful examination of the clinical circumstance. The center of resistance of the unit to be moved is the essential point for the course of action of a force system. Bulcke et al.\(^8\) have reasoned that the quick center of resistance for the 6 foremost teeth was situated at 7.0 mm apical to the interproximal bone level between the central incisors (measured perpendicular to the occlusal plane).

Utilizing the area of the center of resistance for the 6 front teeth characterized by Bulcke et al., the length of the LA and the position of the MI are resolved on the lateral cephalogram before retraction (Figure 8).

The LA, made of 0.9 mm stainless steel wire, is fastened onto the mushroom archwire between the lateral incisors and canines and the fitting LA length is resolved. The correct insertion site of the MI is measured from an aide bar made of 0.018 by 0.018” stainless steel wire and occupied with the molar bracket. Surveying the thickness of the palatal soft tissue and the accessible bone amount at the craved implantation site controls the fitting insert length (Figure 9).

**Torque in Lingual and Labial Orthodontics**

Lingual orthodontics has grown quickly as of late; in any case, research on torque control change of the maxillary incisors in both lingual and labial orthodontics is still restricted, particularly studies with 3-dimensional finite element methods. Intensive comprehension of the biomechanical contrasts of incisor torque control amid lingual and labial orthodontic treatment is basic for the best results.

**Figure 7:** Analysis of the reaction of the anterior teeth to different applications of the line of action of the retraction force. In all cases, a 0.018 by 0.018” stainless steel mushroom archwire is placed from first molar to first molar in the upper arch, and 0.9 mm stainless steel LAs are soldered onto the mushroom archwire between the lateral incisors and canines. The desired line of action of the retraction force with respect to the center of resistance of the anterior segment is established by adjusting the length of the LA and the position of the MI. The tendency toward translation or tipping and simultaneous extrusion or intrusion of the anterior teeth during retraction will be determined by the direction of the retraction force. LA: Lever-arm; MI: Mini-implant; CR: Center of resistance of the anterior teeth. (A) Force system for bodily movement of the anterior teeth: (a) The anterior teeth will retract bodily and intrusively; (b) The anterior teeth will retract bodily; (c) The anterior teeth will retract bodily and extrusively. (B) Force system for distal crown movement of the anterior teeth: (a) The crown of the anterior teeth will move distally and intrusively; (b) The crown of the anterior teeth will move distally; (c) The crown of the anterior teeth will move distally and extrusively. (C) Force system for distal root movement of the anterior teeth: (a) The root of the anterior teeth will move distally and intrusively; (b) The root of the anterior teeth will move distally; (c) The root of the anterior teeth will move distally and extrusively.\(^7\)
Hadia: Torque in Lingual Appliance

According to clinical situations, the length of the lever-arm and the position of the mini-implant are determined on the lateral cephalogram. OP: Occlusal plane, IPBL: Interproximal bone level between the central incisors, CR: Center of resistance of the 6 anterior teeth, LA: Lever-arm, GB: Guide bar

Intraoral photographs before (a) and after (b) establishing a lever-arm and mini-implant system.

CONCLUSION

Lingual orthodontics ought to not just take after the clinical experience of the labial strategies yet ought to build lingual root torque, increase vertical intrusive force, and lessening horizontal retraction forces appropriately to accomplish the best orthodontic results.

REFERENCES


Figure 8: According to clinical situations, the length of the lever-arm and the position of the mini-implant are determined on the lateral cephalogram.

Figure 9: Intraoral photographs before (a) and after (b) establishing a lever-arm and mini-implant system.