

An overview of the Bi-dimensional Technique

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Abstract

Loss of torque in the anterior region has long stood as a problem during space closure by sliding mechanics. This particularly occurs due to play between archwire and brackets. Various methods of retaining torque involves the use of torquing auxiliaries or twisting of rectangular archwires. Bidimensional technique is one such method which minimizes incisor torque loss during retraction by reducing the play between the archwire and the bracket, by ensuring full engagement of wire in the bracket slot. At the same time it reduces friction in the posterior teeth thereby preventing anchorage loss. The purpose of this article is to provide an overview of various bidimensional techniques.

Keywords: Torque, Bidimensional Technique, Sliding Mechanics

Introduction

Torque may be defined as force generated by a twisted wire in an attempt to untwist itself when engaged in the bracket slot¹. During anterior retraction following premolar extraction, one of the major drawback, after anchorage loss, is loss of anterior torque. This is mainly due to play between archwire and bracket slot. Due to this, the designated prescription of torque for any bracket is not fully expressed. Torque loss in anterior region leads to flattening of facial profile and insufficient incisal guidance. Thus to overcome this the bimetric system² was first described, which had undergone timely modifications upto now. The purpose of this article is to provide an overview of various bidimensional techniques.

Various bidimensional techniques

As the name suggests “Bi” means two “Dimension” means measurement.

Thus the variation can be either in bracket slot dimension or the archwire itself. The main impetus towards development and modification of this system was to establish ideal interincisal angle, adequate incisor contact, and sagittal adjustment required for ideal occlusion by minimising the “slot play”³.

Bimetric System

The first attempt to minimise torque loss during anterior retraction was put forth by Schudy and Schudy, in their “Bimetric System”². It was a standard edgewise appliance system (without built-in tip, torque and rotation) with two bracket slot sizes: 0.016 inch slot bracket on incisors and

canines and 0.022 inch slot brackets on premolars and molars. The wire used was 0.016”x0.022” Stainless steel with a 90° twist distal to canines. This ensured 0.016”x0.022” edgewise wire in the anterior brackets and 0.022”x0.016” ribbon arch wire in the posterior brackets establishing what they called the “Precision-fit principle.”

Bidimensional System

Following the work of Schudy and Schudy, Gianelly introduced two modifications of the technique: The first was a “bidimensional-wire” technique⁴. This employed non-preadjusted 0.022x0.028-inch brackets on all teeth and 0.016”x0.022” archwire similar to that used by Schudy and Schudy. But the difference lies in the wire engagement. (It should be noted that the terms “tight fit” and “loose fit” were used by Gianelly). The wire was twisted 90° distal to lateral incisors such that a 0.022”x0.016”-inch ribbon segment engages in the region of anterior brackets thereby providing a tight fit and 0.016”x0.022”-inch engages in the buccal segments, thus providing loose fit (clearance of 0.006”) for sliding mechanics and space closure.

The second was the “bidimensional-slot” technique⁵, which used a preadjusted, edgewise brackets with 0.018” slot on incisors and 0.022” slot on canines, premolars and molars and 0.018”x0.022” Stainless steel wire. The principle was the same, providing smaller brackets on incisors for three-dimensional control and larger brackets on posteriors for facilitation of sliding mechanics. It should be

noted that a clearance of 0.004” is provided in the buccal segments, which also makes insertion of the wire easier. Further if torque is required in the canine region, the wire is twisted 90° twice at the mesial and distal end of canine bracket, thus ensuring full engagement by 0.022”x0.018” wire segment.

Dual-slot System

Following the work of Schudy and Schudy, and Gianelly, the dual-slot system was developed by Rinchuse. This technique incorporates the advantages of both 0.018-inch slot and 0.022-inch slot. It uses 0.018-inch slot on anteriors and 0.022-inch slot in posteriors with a single stainless steel retraction wire of 0.018”x0.025” dimension. Thus a single wire provides 3D control in anterior region and sufficient stiffness in 0.018-inch slot to prevent deformation and notching. According to Proffit, there should be at least 2 mil clearance (4 mil being desirable) between the archwire and the bracket slot for sliding teeth⁶. So specifically, 0.018”x0.025” wire provides 4 mil clearance between the wire and larger sized 0.022-inch brackets, thereby reducing resistance to sliding. The other benefits of this technique which make it different from its predecessors, is en-masse retraction of anteriors, thus further reducing treatment time of approximately 8 months in contrast to two-step retraction⁷. As such there is no significant difference found in the amount of root resorption between two step and en-masse retraction procedures.

Another difference lies in the use of round NiTi wires during initial stages of alignment



and levelling, to avoid jiggling movement of root apices by the use of rectangular wire.⁸

Recent trends

Hybrid Self-ligating bracket system: It is an evolution of previous techniques as proposed by Rinchuse and Miles⁹, which involves use of either 0.018-inch or 0.022-inch self ligating brackets on teeth but with active clip on anterior and passive slide on posterior brackets. Active self-ligating brackets being more efficient in expressing torque in anteriors and passive brackets helps in reducing friction during sliding.

Dual-slot self ligating system: Involves use of 0.018-inch active anterior self-ligating brackets and 0.022-inch passive posterior self-ligating brackets, further providing excellent 3D control in anteriors and more reduced resistance to sliding. Other Modifications involves

Dual-slot self ligating active and Dual-slot self ligating passive.

Benefits of the technique

- * Greater torque and three dimensional control is provided by full bracket slot engagement.
- * Adequate clearance in the buccal segments between the bracket slot and

archwire permits easy sliding by reducing resistance to wire movement.

- * Decreased friction in the posterior region prevents anchorage taxation.
- * En-masse retraction further reduces treatment time.
- * Root resorption is similar to that caused by straight wire technique.
- * Does not require the use of torquing auxiliaries.

Conclusion

Apart from the benefits of this technique, only 5% of the practitioners are using this technique¹¹. Thus indicating less popularity among the clinicians. Further studies in the form of randomised clinical trial, systematic review and meta-analysis, should be favoured to highlight the benefits of this simple, effective and efficient technique.

References

1. Rauch Ed. Torque and its application to orthodontics. Am J Orthod 1959; 45:817-830.
2. Schudy FF, Schudy GF. The Bimetric system. Am J Orthod 1975; 67: 57-91.
3. Archambault A, Lacoursiere R, Badawi H, Major PW, Carey J, et al. Torque expression in stainless steel orthodontic brackets. A systematic review. Angle Orthod 2010; 80: 201-210.

4. Gianelly AA, Bednar JR, Dietz VS. A bidimensional edgewise technique. J Clin Orthod 1985; 19: 418-421.
5. Gianelly AA. Bidimensional Technique: Theory and Practice, GAC Int Inc. Central Islip, NY 2000
6. Proffit WR, Fields Jr HW, Sarver DM. Contemporary Orthodontics. (4th edn), St Louis, Mosby. 2007; 376, 553.
7. Xu TM, Zhang H, Oh HS, Boyd RL, Korn EL, et al. Randomised clinical trial comparing control of maxillary anchorage with 2 retraction techniques. Am J Orthod Dentofacial Orthop 2010; 138: 1-9.
8. Rinchuse DJ, Rinchuse DJ. Modification of the Bidimensional System, Orthod. (Chic.) 2011; 12; 1:10-21.
9. Rinchuse DJ, Miles P. Self-ligating brackets: Present and Future. Am J Orthod Dentofacial Orthop 2007; 132: 216-222.
10. Giancotti A, Mozzicato P, Greco M. En Masse Retraction of the Anterior Teeth Using a Modified Bidimensional Technique. J Clin Orthod 2012; 46: 267-273.
11. Keim RG, Gottlieb EL, Vogels DS, Vogels PB. Study of Orthodontic Diagnosis and Treatment Procedures Part 1: Results and Trends. J Clin Orthod 2014; 48: 607-630.

Summary of Various Bi-dimensional Techniques

TECHNIQUE	SLOT DIMENSION ANTERIOR	SLOT DIMENSION POSTERIOR	ARCHWIRE DIMENSION ANTERIOR	ARCHWIRE DIMENSION POSTERIOR
Bimetric System	0.016 inch	0.022 inch	0.016”x 0.022”	0.022”x0.016”
Bidimensional-wire technique	0.022 inch	0.022 inch	0.022”x0.016”	0.016”x0.022”
Bidimensional-slot technique	0.018 inch on incisors and 0.022 inch on canines	0.022 inch	0.018”x0.022”	0.018”x0.022”
Dual-slot System	0.018-inch	0.022 inch	0.018”x0.025”	0.018”x0.025”

NOTE: Difference between Gianelly's technique and Rinchuse dual-slot system is en-masse retraction with the latter.

