Bidimensional Technique: A Topical Review

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Abstract

In orthodontics, torquing, particularly in the maxillary incisors is required to overcome play between wire and bracket, for an ideal interincisal angle, adequate incisor contact, and sagittal adjustment of the dentition in order to achieve an ideal occlusion [1]. To investigate torque expression in both conventional and self-ligating brackets, using the finite element method, optical image correlation technique, or some special apparatuses, various studies have been done [2, 3]. In addition, various torquing auxiliaries and twisting of rectangular wire have been tried [4]. Most of these approaches require increased chair side time in wire bending and patient discomfort with unguaranteed effects. Chances of bracket debonding are increased in torqued wires [5]. So, to provide stronger torque control, Schudy and Schudy [6] described the Bimetric System, a fixed orthodontic appliance incorporating two bracket slot sizes. They also argued for what, they called the precision-fit principle, meaning that in the finishing stages, the wires should fully engage the bracket slots, thus, eliminating or significantly reducing play. After that, a “Bidimensional Edgewise Technique” [7] was proposed some years later, followed by “bidimensional technique” [8]. Rinchuje further modified bidimensional technique and developed a dual-slot system [9]. Thus, the purpose of this article is to provide an overview of the bidimensional technique.

Keywords: Torque; Ideal Occlusion; Bidimensional Technique.

Introduction

In orthodontics, torquing, particularly in the maxillary incisors is required to overcome play between wire and bracket, for an ideal interincisal angle, adequate incisor contact, and sagittal adjustment of the dentition in order to achieve an ideal occlusion [1]. To investigate torque expression in both conventional and self-ligating brackets, using the finite element method, optical image correlation technique, or some special apparatuses, various studies have been done [2, 3]. In addition, various torquing auxiliaries and twisting of rectangular wire have been tried [4]. Most of these approaches require increased chair side time in wire bending and patient discomfort with unguaranteed effects. Chances of bracket debonding are increased in torqued wires [5]. So, to provide stronger torque control, Schudy and Schudy [6] described the Bimetric System, a fixed orthodontic appliance incorporating two bracket slot sizes. They also argued for what, they called the precision-fit principle, meaning that in the finishing stages, the wires should fully engage the bracket slots, thus, eliminating or significantly reducing play. After that, a “Bidimensional Edgewise Technique” [7] was proposed some years later, followed by “bidimensional technique” [8]. Rinchuje further modified bidimensional technique and developed a dual-slot system [9]. Thus, the purpose of this article is to provide an overview of the bidimensional technique.

Various Bidimensional Systems

Bimetric system

It is first bidimensional approach in which, 0.016-inch brackets are used on the anterior teeth (canine to canine), while 0.022-inch brackets on the posterior teeth. A 0.016"x0.022" stainless steel archwire is engaged with a 90 degree twist made distal to the canines, so as to “full-sizedly” fill the anterior section as “edgewise,” while the buccal sections are filled as “ribbon” with 0.022"x0.016" arch wire. It was a standard edgewise appliance system with zero base [6].

Bidimensional edgewise technique

In this technique, non-preadjusted 0.022x0.028-inch brackets are used on the anterior teeth (canine to canine), while 0.022-inch brackets on the posterior teeth. A 0.016"x0.022“ stainless steel archwire is engaged with a 90 degree twist made distal to the canines, so as to “full-sizedly” fill the anterior section as “edgewise,” while the buccal sections are filled as “ribbon” with 0.022“x0.016” arch wire. It was a standard edgewise appliance system with zero base [6].

Bidimensional Technique

In fact, it is a “bidimensional-slot” technique. In this system, pre-adjusted edgewise brackets with 0.018-inch slot on incisors and 0.022-inch slot on canines, premolars and molars are used. All the brackets have vertical slots that allows for an array of auxiliaries, such as uprighting springs. Smaller brackets (0.018x0.025-inch) on incisors provide three dimensional control on incisors and “tight fit” as well as larger brackets (0.022x0.028-inch) on posterior teeth provide “loose fit” which facilitates sliding mechanism. When a 0.018x0.022-inch SS archwire is engaged, it “full-sizedly” fits into the anterior brackets, but leaves a clearance of 0.004 inch within the buccal brackets. Since the wire is undersize in the posterior brackets, it is relatively simple to insert, and the posterior teeth do not require the close 3rd-order monitoring, that would be necessary if the wire filled the bracket slots. If, torque is needed in the canine region, then a 90-degree bend is made mesial to the canine bracket, and another 90-degree bend is made distal to the canine bracket; thus the strip of wire in the canine bracket is now 0.02X0.018 and full engagement is achieved. Gianelly used 0.016x0.022-inch SS wire for canine retraction [8]. Nowadays, only the bidimensional-slot technique is used and the bidimensional wire technique is rarely used. Although, the bidimensional technique provides greater torque control on incisors, only few clinical cases are reported [10-12].

Dual-slot System

Over the years after the bidimensional technique, certain modifications were done to enhance efficiency of this technique. It is known as dual-slot system [9]. In this technique 0.018-inch slot is used on anteriors and 0.022-inch slot used on posteriors. This allows use of more stiffer wire (0.018-inch wire into 0.022-inch slot) preventing notching, deformation and increases the efficiency of retraction and greater torque control on anteriors with 0.018-inch slot, since, 0.022”x0.028” wire is too stiff in 0.022-inch slot [13]. Only one retraction wire is used i.e., 0.018x0.025 stainless-steel. 4 mil clearance is maintained in posteriors which will allow better posterior torque control. This much amount of play allow to settle posterior teeth in soft tissue balance and equilibrium because static facial torque prescribed in buccal segments ultimately altered by soft tissue [14]. On the contrary to Gianelly’s bidimensional technique [8], the dual-slot system employs en masse retraction of anterior teeth resulting in reduced treatment time of approximately 8 months as compared with two step-retraction [15]. The other difference is the use of round wire during initial stages of alignment and leveling to avoid adverse effect of rectangular wire on the roots [13].

Another modification of the bidimensional system has been developed i.e., hybrid and dual slot techniques using active and passive self-ligating brackets but yet to be proved clinically [16, 17].

Effectiveness of Bidimensional system

Although, this system seems to be biomechanically appropriate, very few studies were done to prove its effectiveness. In one study, the amount of root resorption was found to be similar when compared with straight wire technique [18]. Greater torque control is observed with this technique [17, 19-21]. Recently, the bidimensional technique was shown to be equally effective in lingual orthodontics [22, 23]. However, according to a recent survey, only 5% practitioners are using this technique [24].

Advantages

The advantages of the bidimensional technique are:

- Greater torque control in incisors due to full slot engagement.
- Very convenient technique, since, it does not require loop formation and arch form is well maintained at the end of treatment.
- This method conserves anchorage because of reduced friction in posterior teeth.
- En masse retraction of anterior teeth reduces treatment time.
- Increased play in posterior teeth makes protraction easy.

Conclusion

Although, the authors of the bidimensional technique claim many advantages, yet, it is still considered a less popular treatment modality. Furthermore, its use is also lacking in surgical cases. Further clinical studies such as randomised clinical trials are needed to prove its effectiveness.

References

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