Acta Scientific Dental Sciences (ISSN: 2581-4893)

Volume 5 Issue 8 August 2021

Review Article

Introducing Nora Torque Selection Analysis

Nasir H Alhamlan*

Department of Dentistry, Specialized Medical Center Hospital, Riyadh, Saudi Arabia

***Corresponding Author:** Nasir H Alhamlan, Consultant in Orthodontics and Chairman of the Dental Department, Specialized Medical Center Hospital, Riyadh, Saudi Arabia.

Received: July 03, 2021

Published: July 21, 2021

Abstract

Finishing anterior teeth with the proper torque is crucial to achieve optimal occlusion, function, esthetics, and stability. Evaluating the need for additional torque and carefully selecting brackets' prescription should be performed on a case by case basis and before starting orthodontic treatment. This paper is presenting a novel analysis developed as a useful guide to help clinicians to conveniently assess anterior teeth torque requirement in order to select the proper brackets' prescription before starting treatment, "Nora Torque Selection Analysis". This analysis includes nine major components that assess pretreatment conditions and integrate individual's treatment preference. A clinical case is analyzed and discussed for further illustration.

Keywords: Torque; Analysis; Orthodontic Bracket Prescription

Introduction

Torque or buccolingual teeth inclination is one of the fundamental six keys of optimal occlusion defined by Andrews. Finishing orthodontic cases with the proper torque is crucial to achieve optimal occlusion and esthetics. It is important to finish maxillary anterior teeth with adequate torque to get efficient anterior guidance, solid class I canines and molars relationship, and to achieve an esthetic smile, which is very important for the patients [1]. Nowadays, it is a common practice for clinicians to rely on one prescription for treating all or at least most of their orthodontics cases. However, this should not be the case since each case is unique. For instance, the mechanics used in extraction cases are usually different from those treated without extraction. That may affect the resulting reactive forces, which may disturb teeth torque eventually. Looking back to history, Andrews realized the importance of considering variable torque prescription after using the original standard straight wire appliance for a period of time. He introduced three different sets of incisor brackets, with different degrees of torque according to the sagittal occlusal relationship. He also introduced extraction and translation series brackets [2]. Unfortunately, inventory issues had not helped Andrews' concept of variable prescription to prosper [3]. After decades, the succeeding prescription generations offered prescriptions with variable torque values. Comparing available brackets' prescriptions viewing anterior teeth, Roth has relatively low torque values whereas Hilgers can be considered as high torque option, and MBT offer average or standard torque values [4]. Several orthodontic manufacturers offer anterior teeth brackets with variable torque values for a single system. Moreover, digitally customized prescription brackets were introduced recently "Insignia", which are custom-made for each case. However, there is an extra cost built-in to that and still most clinicians are relying on the conventional prefabricated prescription brackets [5].

McLaughlin and Bennet reported that third order bends to adjust upper and lower incisors' torque are the most frequently needed compensatory bends in the finishing stage with preadjusted bracket system [6]. Also, Thomas and Johnson stressed the importance of tailoring torque prescriptions to the treatment needs of each case to reduce the need for extra archwire adjust-

ment and shorten the overall treatment time [7,8]. That being said, it might be confusing or challenging for the clinician to determine the suitable torque prescription before starting each orthodontic case since there are several factors that may affect torque selection. This paper is introducing a novel pretreatment analysis "Nora Torque Selection Analysis" that was developed to take into account major factors that may affect anterior teeth torque before or during treatment (Table 1). This is intended to help clinicians to overcome selection challenges and decide which torque prescription for upper and lower anterior teeth (canine to canine) is needed to provide a more efficient treatment for an individual case. This analysis integrates nine important factors that may affect torque selection, three factors involve the assessment of the pretreatment condition: incisors inclination, line of occlusion, and gingival recession. The other six factors of the analysis deals with the effect of the planned treatment and mechanics: bracket position, working wire-slot play, need for space closure, use of inter-arch elastics, use of open coil, and use of class II correction appliances. Each factor is given one of these values (+2, +1, 0, or -1) for each anterior tooth. A value of "+2" and "+1" indicate the need for additional lingual root torque or more positive torque prescription, whereas a value of "-1" suggests the need for reducing lingual root torque requirement or lower torque prescription, and "0" implies neutral status or standard torque requirement. Each factor is discussed separately, followed by applying the analysis on an actual clinical case for the sake of practical demonstration.

	Upper					
	Right			**Left**		
	Canine	**Lateral**	**Central**	**Central**	**Lateral**	**Canine**
Tooth inclination						
Line of occlusion						
Gingival recession						
Bracket Position						
Working wire-slot play						
Space closure						
Inter-arch elastics						
Open coil						
Class II correctors						
Net torque selection index						
	Lower					
	Right			**Left**		
	Canine	**Lateral**	**Central**	**Central**	**Lateral**	**Canine**
Tooth inclination						
Line of occlusion						
Gingival recession						
Bracket position						
Working wire-slot play						
Space closure						
Inter-arch elastics						
Open coil						
Class II correctors						
Net torque selection index						

Table 1: Nora torque selection analysis- template.

Tooth inclination

Pretreatment tooth inclination is one of the most important factors that need to be considered during torque selection [7,8]. In this component of the analysis, all anterior teeth (canine to canine) should be evaluated. If a tooth is significantly retroclined according to the pretreatment assessment, a value of "+1" is recommended to be used in Nora Torque Selection Analysis (NTSA) indicating the need for additional lingual root torque to help in normalizing the tooth buccolingual inclination. However, a value of "-1" should be used in the reverse situation and a value of "0" should be plugged-in when the inclination is adequate. It is important to look at the inclination tooth by tooth, meaning that it should not be evaluated by relying on the cephalometric measurement only since it is usually taken at one tooth- most proclined incisor. Clinical examination, diagnostic models, and three-dimensional imaging (CBCT) can be helpful for more precise evaluation. To further illustrate, in a typical class II division 2 case, the upper lateral incisors are often proclined and a value of "-1" is recommended for the "tooth inclination" component, however, the upper centrals are usually retroclined, thus a value of "+1" should be used. Therefore, it is more accurate to assess inclination tooth by tooth. It is recommended to exclude lingually displaced anterior teeth from this component to avoid confusion and/or overlap. A value of "0" would be used for excluded teeth.

Line of occlusion

The second pretreatment factor to be considered is the "line of occlusion". It is defined as the line passing through the incisobuccal contacts and to which the teeth must conform to be in the normal occlusion [9]. In this component of the analysis, all anterior teeth (canine to canine) should be evaluated. It is advised to use a value of "-1" or "-2" for this component if a tooth was displaced lingual to the line occlusion prior to orthodontic treatment, because labial root torque is needed instead of the standard lingual root torque while moving the tooth more labially into the line of occlusion for bodily movement and enhanced stability. That is similar to cases where the lateral incisors are lingually (palatally) blocked out. A higher negative value "-2" would be recommended in a more severe lingual displacement. However, a value of "+1" or "+2" is recommended when the pretreatment tooth position is labial to the line of occlusion since higher lingual root torque would be more efficient to correct the tooth position bodily. A value of "0" is suggested when the tooth is positioned within the line of occlusion.

Gingival recession

Laursen., *et al*. reported that positioning the root toward the center of the alveolar bone housing reduced gingival recession [10]. It is not favorable in general for periodontal health to move the roots more labially when a labial gingival recession is already present [7,11]. Therefore, "gingival recession" was integrated into the presented analysis as one of the pretreatment factors. A value of "+2" is recommended to be plugged- in when an anterior tooth has labial gingival recession to resist torquing the root labially. A "+2" is suggested here instead of "+1", which was used for other components to provide more weight since periodontal health is highly important: When no gingival recession is present, a value of "0" should be used. All anterior teeth (canine to canine) should be evaluated in this component.

Bracket position

Clinician's planned treatment or preference may affect torque selection. The incisogingival or vertical bracket position may affect torque expression [12-14]. Placing an anterior bracket more incisally may lead to greater torque expression and thus more tooth proclination and vice versa. Hence in this analysis, if the bracket was planned to be placed more incisal to the middle of the crown, a value of "-1" should be given to counteract the increased torque expression, whereas if the bracket was planned to be placed more gingival, a value of "+1" is recommended to compensate for the decreased torque expression. If the bracket slot was planned to be placed at or close to the center of the crown, a value of "0" is suggested since that may help in expressing the prescribed torque. All anterior teeth (canine to canine) should be evaluated in this component.

Working wire-slot play

It is well known that the greater the difference between the sizes of the archwire and the slot, the greater the gap and the wire-slot play would be. Subsequently, torque expression might be affected negatively [15]. Thus, a value of "+1" is suggested to be added in this component when the working wire is planned to be smaller than .019" x .025" stainless steel in a .022-bracket system or smaller than .016" x .022" stainless steel in an .018-bracket system. A value of "0" should be used if the mentioned wire sizes were used in the corresponding systems whereas a value of "-1" is suggested to be used in this component when the working wire is planned to be larger than those mentioned since the wire-slot play would be

smaller. All anterior teeth (canine to canine) should be evaluated in this component.

Need for space closure

Anterior teeth retraction to close pre-existing or extraction spaces may result in lingual tipping of the crowns [2,7]. To overcome or minimize this effect, a value of "+1" is recommended for this component when space closure is planned. However, a value of "0" should be used for this component when no spaces are present, and no extraction is planned. All anterior teeth (canine to canine) should be evaluated in this component.

Use of inter-arch elastics

It is well known that the prolonged use of class II elastics may cause retroclination of upper anterior teeth and proclination of lower anterior teeth, and the opposite may occur from class III elastic use [16]. Hence, it is recommended to plug-in a value of "-1" for the lower incisors when class II elastic use is planned and also for the upper incisors when class III elastics is planned, canines are excluded. However, a value of "+1" is recommend for all lower anterior teeth (incisors and canines) when class III elastic use is planned and also for all upper anterior teeth including the canines when class II elastic use is planned, canines are recommended to be included here when the elastics are applied directly on their brackets.

Use of open coil

Forces resulting from open coil use for space opening may result in significant facial tipping of adjacent teeth. So, it is recommended to plug-in a value of "-1" for the two teeth located next to the ends of the open coil to counteract this facial crown tipping. For example, when an open coil is planned to be used between the upper right canine and upper right central incisor to create space for the palatally displaced lateral incisor, a value of "-1" should be added for the upper right canine and central incisor in this component. All anterior teeth (canine to canine) should be evaluated in this component.

Use of class II correction appliances

Class II correction appliances work by proclining and protruding lower incisors, and retroclining and retracting upper incisors (17) (18) [16-18]. These appliances are attached to the archwire and the effect on the canines is indirect, hence, it is recommended to exclude the canines from this component. To further illustrate, if a class II corrector is planned to be used, a value of "+1" is recommended for upper incisors and a value of "-1" for the lower incisors. Bear in mind that Class II intermaxillary elastics are often used after class II correctors for maintenance or further correction, that is why it is also recommended to utilize the "use of inter-arch elastics" component to counteract the additional forces.

Clinical case analysis

A 13-year-old male presented with class II subdivision right malocclusion and bimaxillary crowding (Figure 1). The upper and lower incisors were proclined (U1-PP = 117.1°, L1-MP = 94°). Nora Torque Selection Analysis (NTSA) was applied to decide which anterior torque prescription would be more efficient to use (Table 2). This case is discussed as a practical example.

Figure 1: Initial intraoral photographs and lateral cephalometric radiograph. A. Maxillary occlusal view. B. Right buccal view. C. Frontal view. D. Left buccal view. E. Mandibular occlusal view. F. Lateral cephalometric radiograph.

	Upper					
	Right			Left		
	Canine	Lateral	Central	Central	Lateral	Canine
Tooth inclination	0	-1	-1	-1	0	0
Line of occlusion	0	0	0	0	-1	0
Gingival recession	0	0	0	0	0	0
Bracket Position	0	0	0	0	0	0
Working wire-slot play	0	0	0	0	0	0
Space closure	+1	+1	+1	+1	+1	+1
Inter-arch elastics	+1	+1	+1	+1	+1	+1
Open coil	0	0	0	-1	0	-1
Class II correctors		0	0	0	0	
Net torque selection index	+2	+1	+1	0	+1	+1
	Lower					
	Right			Left		
	Canine	Lateral	Central	Central	Lateral	Canine
Tooth inclination	0	-1	-1	-1	0	0
Line of occlusion	0	0	0	0	-1	+1
Gingival recession	0	+2	0	0	0	0
Bracket position	0	0	0	0	0	0
Working wire-slot play	0	0	0	0	0	0
Space closure	+1	+1	+1	+1	+1	+1
Inter-arch elastics	0	-1	-1	-1	-1	0
Open coil	0	0	0	0	0	0
Class II correctors		0	0	0	0	
Net torque selection index	+1	+1	-1	-1	-1	+2

Table 2: Applying Nora torque selection analysis-case example.

The analysis starts with evaluating three pretreatment factors determined by the preexisting condition: tooth inclination, line of occlusion and gingival recession. Since the incisors were proclined, a value of "-1" was added for all incisors in the "tooth inclination" component except for the lingually displaced upper and lower left lateral incisors, where a value of "0" was used. Looking at the line of occlusion, the lower left canine was buccally displaced, however, the upper and lower left lateral incisors were lingually displaced. Thus, a value of "+1" and "-1" were used, respectively, in the "Line of Occlusion" component. These values were planned to assist in moving the roots bodily while aligning the teeth into the arch. There was no gingival recession detected at the anterior teeth except at the lower right lateral incisor. So, a value of "+2" was used for this lateral in the "Gingival Recession" component. That would help to resist labial root movement that may worsen the recession.

The six remaining factors are contingent on the clinician's planned treatment and preferred mechanics: bracket position, working wire-slot play, need for space closure, use of inter-arch elastics, use of open coil, and use of class II correction appliances. The brackets' position canine-canine in both arches was planned to be close to the center of the crown. So, a value of "0" was used for all anterior teeth in the "bracket position" component. Also, the clinician planned to use a .019" x .025" SS wire as the working wire in a .022-bracket system. That would make the ultimate or the working wire-slot play relatively small and help in expressing most of the

prescribed torque. So, a value of "0" was plugged-in for all anterior teeth in the "working wire-slot play" component. Extraction of four premolars was planned. So, value of "+1" was used in the "need for space closure" component for all teeth. The clinician anticipated the need for class II elastics use from the upper canines to the lower first molars for control and finishing. Therefore, a value of "+1" was added for all upper anterior teeth canine to canine while a value of "-1" was used for the lower incisors. The lower canines had a value of "0" since the elastics would not be attached directly to these teeth. The clinician planned the use of open coil between the upper left central incisor and canine to make room for the lingually displaced upper left lateral incisor. Thus, a value of "-1" was plugged-in for the upper left canine and central incisor to offset the open coil facial crown tipping forces. No class II correctors were planned to be used in this case. Hence, a value of "0" were used for all the incisors.

The values were summed-up for each tooth to determine the net torque selection index for each. A net value of "0" indicates a standard or average torque prescription would probably be sufficient for the corresponding tooth. A positive net value of "+1", "+2", or "+3" indicates the need for a higher lingual root (more positive) torque prescription. The higher the positive net number, the greater the need for positive torque, meaning that a high net value (> +2) like "+3" may indicate the need for additional torque adjustment during finishing by wire bending or the use of torquing auxiliary. Quite the reverse, a negative net value "-1" or "-2" indicates the need for a less lingual root torque prescription. When the net value is highly negative (<-2) like "-3" that may also indicate the need for wire bending, use of torqueing auxiliary or negative torque prescription.

Conclusion

It is recommended to look at each case carefully before selecting brackets prescription especially the torque. Nora torque selection analysis (NTSA) was developed to help in anterior teeth torque selection before starting orthodontic treatment. The analysis integrated major factors that may affect torque selection before and during orthodontic treatment, in order to help clinicians to make selection procedure easier and more objective. NTSA may be also helpful to anticipate the additional need for wire adjustment or torquing auxiliary at a specific tooth during finishing. Future clinical research is recommended to evaluate the effectiveness of the presented analysis and to direct the need for further modifications or improvements.

Conflict of Interest

No conflict of interest to declare.

Bibliography

1. Andrews LF. "The six keys to normal occlusion". *American Journal of Orthodontics* 3.62 (1972): 269-309.

2. Andrews LF. "The straight wire appliance explained and compared". *Journal of Clinical Orthodontics* 3.10 (1976): 174-195.

3. Tariq M and Asif S. "An Overview of the Andrews Preadjusted Edgewise Appliance". *Indian Journal of Orthodontics and Dentofacial Research* 1.2 (2016): 32-33.

4. Lacarbonara M., *et al*. "Variable Torque Prescription: State of Art". *Open Dentistry Journal* 9 (2015): 60-64.

5. Penning EW., *et al*. "Orthodontics with Customized Versus Noncustomized Appliances: A Randomized Controlled Clinical Trial". *Journal of Dental Research* 13.96 (2017): 1498-1504.

6. McLaughlin RP and Bennet JC. "The Transition from Standard Edgewise to Preadjusted Appliance Systems". *Journal of Clinical Orthodontics* 3.23 (1989): 142-153.

7. Thomas WW. "Variable Torque for Optimal Inclination". *Clinical Impressions* 1.17 (2009): 1-9.

8. Johnson E. "Selecting custom torque prescriptions for the straight-wire appliance". *American Journal of Orthodontics and Dentofacial Orthopedics* 143 (2013): 161-167.

9. Ricketts R. "A Detailed consideration of the line of occlusion". *Angle Orthodontist* 4.48 (1978): 274-282.

10. Laursen MG., *et al*. "The role of orthodontics in the repair of gingival recessions". *American Journal of Orthodontics and Dentofacial Orthopedics* 157 (2020): 29-34.

11. Machado AW., *et al*. "Spontaneous improvement of gingival recession after correction of tooth positioning". *American Journal of Orthodontics and Dentofacial Orthopedics* 6.145 (2014): 828–835.

12. Papageorgiou SN., *et al*. "Torque differences according to tooth morphology and bracket placement: a finite element study". *European Journal of Orthodontics* 4.39 (2017): 411-418.

13. RR Miethke. "Third order tooth movements with straight wire appliances. Influence of vestibular tooth crown morphology in the vertical plane". *Journal of Orofacial Orthopedics* 58 (1997): 186-197.

14. Sardarian A., *et al*. "The effect of vertical bracket positioning on torque and the resultant stress in the periodontal ligament—a finite element study". *Progress in Orthodontics* 1.15 (2014): 50.

15. Archambault A., *et al*. "Torque Expression in Stainless Steel Orthodontic Brackets". *Angle Orthodontist* 1.80 (2010): 201-210.

16. Jones G., *et al*. "Class II non-extraction patients treated with the Forsus Fatigue Resistant Device versus intermaxillary elastics". *Angle Orthodontist* 78 (2008): 332-338.

17. Konik M., *et al*. "The mechanism of class II correction in late Herbst treatment". *American Journal of Orthodontics and Dentofacial Orthopedics* 112 (1997): 87-91.

18. Schaefer AT., *et al*. "A cephalometric comparison of treatment with the Twin-Block and stainless steel crown Herbst appliances followed by fixed appliance therapy". *American Journal of Orthodontics and Dentofacial Orthopedics* 126 (2004): 7-15.

Volume 5 Issue 8 August 2021