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# Changes of Teeth Inclination After Orthodontic Treatment of Class II Division 1 Malocclusion

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**الخلاصة**

**الأهداف:** يهدف البحث الى تقييم درجة التحسن في ميلان الأسنان بالأتجاه الشفهي اللساني او الحدي اللساني بعد علاج حالات الصنف الثاني– النوع الأول من سوء الأطباق بأستخدام ( أدوات روث ) ومقارنة ميلان الأسنان لتلك الحالات مع عينة مكونة من أشخاص ذوي أطباق طبيعي (الصنف الأول) لإيضاح قدرة (أدوات روث ) على إعطاء نتائج مقبولة باستخدام أسلوب السلك المستقيم في العلاج. **المواد وطريقة العمل :**إشتملت الدراسة على خمسة وعشرين مريضا يعانون من الصنف الثاني – النوع الأول من سوء الأطباق تتراوح أعمارهم بين ( 15–25) سنة تمت معالجتهم بأستعمال نظام ( روث 22 ) بعد أن تمت عملية قلع الضاحك العلوي الأول والضاحك السفلي الثاني من أجل تصحيح علاقة كل من الأضراس والأنياب. ومن ثم تمت مقارنة ميلان الأسنان في أمثلة الدراسة العائدة لأربع مجاميع، وهي:أمثلة الدراسة المأخوذة قبل العلاج ، بعد العلاج، و بعد مرور سنة على العلاج فضلا عن مجموعة السيطرة (الصنف الأول الطبيعي ) باستعمال آلة قياس خاصة. **النتائج:**لوحظت فروق معنوية بين المجاميع الأربعة في أغلبية الأسنان باستثناء الأضراس الأولى والضواحك الأولى العلوية، مع ظهور أعلى القيم في مجموعة ( قبل العلاج). **الأستنتاجات :**تشتت واضح تمت ملاحظته حول معدل عزم الدوران في المجاميع الأربعة مع زيادة ميلان الأسنان بالأتجاه اللساني للأسنان الواقعة بالأتجاه الوحشي .ساعدت الحواصر مسبقة التعديل في تقليل الميلان الشفهي للأسنان المعالجة من الصنف الثاني –القسم الأول من سوء الأطباق مقارنة ميلانها الى ذلك المسجل في مجموعة السيطرة (الأطباق الطبيعي).

## ABSTRACT

**Aims:** The aims of the study are to evaluate the degree of improvement in labiolingual or buccolingual inclination of the teeth after treatment of class II division 1 malocclusion using Roth appliance and to compare the teeth inclination after treatment with that of normal occlusion samples to show if Roth appliance can give a reasonable result with straight arch wire technique. **Materials and Methods:** A twenty five patients (15–25 years age) with Class II division 1 malocclusion were treated with Roth 22" bracket system after extraction of upper first and lower second premolars to correct molars and canine relation, then the teeth inclination were compared among the four groups on the study casts that were taken before treatment, after treatment, after 1 year retention, and with the control group (25 dental casts of normal Class I occlusion) using special gauge. **Results:** Significant differences were seen among the four groups in the most of the teeth with the exception of the first molars and upper first premolars with the highest possible value in the(before treatment group). **Conclusions:** A considerable dispersion around the mean torque measurements was seen in the four groups , more lingual inclination was noticed in distally situated teeth. The preadjusted brackets help in decreasing the labial inclination of the treated teeth in Class II malocclusion making their inclination nearly to control group.

**Key words:** Teeth inclination, Class II division 1, Roth appliances.

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## INTRODUCTION

Fixed appliance therapy is one of the most widely used treatment modalities in orthodontic therapy appropriate placement of bracket followed by engagement with rectangular arch wire, confers adequate torque, tip to the tooth. This allows correct inclination and angulations so that the finished treatment meets Andrews six keys to normal occlusion[1,2].

Orthodontic treatment objectives can be stated as obtaining functional occlusion, esthetic and stability. One of the criteria for obtaining a functional occlusion is to have an ideal axial inclination of all teeth at the end of active treatment[3].

The force of torque is probably the most important and powerful force produced when a rectangular wire was associated to a bracket with a rectangular slot[4]. Preadjusted or straight wires appliances are designed to reduce or elimi-

nate the need for placing bends in fully engaged straight wires[5]. The straight wire appliance is therefore an individualized appliance where each bracket is tailored to the morphological and positional norms for each tooth type[6]. In addition the advent of sophisticated appliances and materials has helped to raise the standards of orthodontic treatment and as a consequence achieving an "ideal occlusion" has become a realistic aim[7].

Faciolingual inclination of the dentition has been studied by employing different methods on untreated, ideal occlusion, treated occlusion and tooth positioned setups, as well as extracted teeth[8–10] by using study model, cephalometric roentgenography and photography.

Several studies on the faciolingual inclination have been published[11–20] but only few statistical investigation have been performed. These reports concluded that there was a considerable variation in faciolingual inclinations in normal occlusion.

Class II division 1 malocclusion represents the second most common type of malocclusion after crowding[21–24] and it is the most frequently seen skeletal disharmony in orthodontic population.

The aims of this study are to evaluate the degree of improvement in labiolingual or buccolingual inclination of the teeth after treatment of class II division 1 malocclusion using Roth appliance and to compare the teeth inclination after treatment with that of normal occlusion samples and to show if there are differences among before, after, and after one year retention.

## MATERIALS AND METHODS

The sample of this study was consisted of 25 dental casts for individuals aged 15–25 years old with normal occlusion as controlled group, 25 casts for patients aged 15–25 years old with class II division 1 malocclusion, 25 casts for the same patients after completion of orthodontic treatment and 25 casts for the treated patients after 1 year retention.

The criteria for sample selection for normal occlusion group included molar and canine Class I normal occlusion, and for Class II malocclusion group the molar and canine are in Class II on centric jaw relation. Both groups with full set of teeth (with the exception of wisdom teeth), no history of previous orthodontic treatment, normal teeth shape, without crowding, spacing, no sever rotation, no open bite, posterior cross bite and no dental arch asymmetry.

All Class II patients were treated by the extraction of upper first and lower second premolars to obtain molar and canine class I relation with normal overbite and overjet after orthodontic treatment with fixed appliances (Dentaurum brackets Roth 22" system) for both upper and lower arches.

The leveling and alignment was done by super elastic (Nitinol) arch wires starting from 0.014" to 0.018" round wires then by 0.017x22" or 0.018x22" rectangular wires.

Space closure and upper canine retraction was done using sliding mechanics on stainless steel rectangular arch wire size 0.018x0.022" with the use of power chain elastics. Then the upper incisor teeth were retracted by 0.018 x 0.025" inch stainless steel wire using tear drop loops activated 1–1.5 mm every 1 month.

After case finishing , the appliance was removed and an impression was taken for both arches and then Howly retainer was constructed for the upper arch to prevent the relapse. Then another impression was taken after 1 year of retention for both arches to compare among them (so that each patient have three sets of upper and lower casts, before treatment, after treatment and after 1 year retention).

Measurements were done on the dental models to assess the labiolingual teeth inclination (torque) of the teeth by the intersection of a line perpendicular to the occlusal plane, and a line tangent to the middle of the labial or buccal long axis of the clinical crown[2,25] (LA points) using a simple instrument (locally constructed) for this purpose. This instrument was used previously by Vardimon and Lambertz[9] and AL–Sayah[19] as shown in Figure (1).

This gauge was constructed out of a geometric triangle a plumb line emerging from the vertex of the protractor, and a thin flat rectangular metal piece. The extended metal piece was attached to the right angled triangle with one side parallel to the ordinate and the other aligned with

the abscissa. The torque angle of a given tooth was calculated by subtracting 45° from the measured angle as shown in Figure(2). A reading took the ordinate of the rectangular metal made a single contact with the LA points with the plumb line touching the triangular abscissa without breaking its planer integrity. The measurements were established by placing the occlusal plane of the model on the surveyor after adjusting its table parallel to the horizontal plane. Analysis of variance (ANOVA) and Duncan's multiple analysis range tests were used for each individual tooth among all groups to compare their faciolingual inclination.

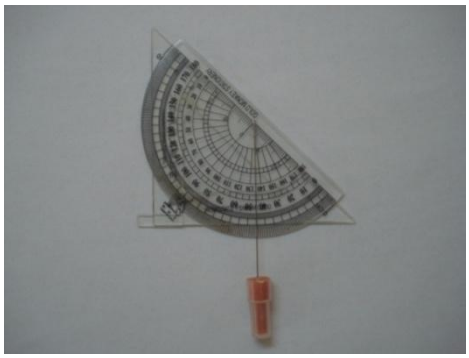

Figure (1): The instrument used to measure the faciolingual crown inclination.

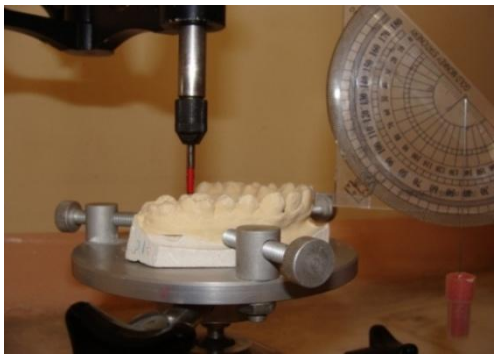

Figure (2): The method of figure measuring the torque angle using the measurement gauge.

## RESULTS

Table (1) shows the torque value for the before treatment group: the upper anterior teeth, with the exception of upper left canine showed positive values while the posterior teeth and lower left canine demonstrated a negative value. In lower arch the mean torque value was positive in the right and left central and lateral incisors while the rest of the teeth showed a negative value.

Table (1): Descriptive statistics of (before treatment) group.

| Tooth | Side | No. | Min. | Max. | Mean | SD |
|---|---|---|---|---|---|---|
| **Upper arch** | | | | | | |
| **Central** | Right | 25 | 0 | 29 | 17.84 | 6.688 |
| | Left | 25 | 2 | 30 | 17.80 | 6.714 |
| **Lateral** | Right | 25 | –5 | 21 | 11.20 | 6.904 |
| | Left | 25 | –5 | 20 | 10.56 | 7.487 |
| **Canine** | Right | 25 | –6 | 10 | 0.16 | 4.543 |
| | Left | 25 | –14 | 22 | –0.60 | 6.455 |
| **2nd Premolar** | Right | 25 | –16 | 9 | –8.08 | 5.267 |
| | Left | 25 | –19 | –1 | –9.16 | 3.944 |
| **1st Molar** | Right | 25 | –24 | 0 | –10.96 | 5.955 |
| | Left | 25 | –25 | –2 | –12.80 | 6.035 |
| **Lower arch** | | | | | | |
| **Central** | Right | 25 | –7 | 17 | 6.24 | 7.502 |
| | Left | 25 | –6 | 17 | 3.84 | 7.214 |
| **Lateral** | Right | 25 | –15 | 16 | 3.68 | 8.074 |
| | Left | 25 | –15 | 21 | 3.84 | 8.335 |
| **Canine** | Right | 25 | –18 | 5 | –5.52 | 6.063 |
| | Left | 25 | –17 | 5 | –4.52 | 5.832 |
| **1st Premolar** | Right | 25 | –21 | –10 | –14.88 | 2.977 |
| | Left | 25 | –21 | –8 | –14.96 | 3.623 |
| **1st Molar** | Right | 25 | –30 | –15 | –23.72 | 4.043 |
| | Left | 25 | –30 | –15 | –22.60 | 4.491 |

Measurements in degrees.

Table (2) exhibits the descriptive statistics for the after treatment group; in the upper arch the right and left central and lateral incisors showed a labial inclination while the rest of the upper arch teeth appeared with a lingual inclination. The entire lower arch teeth exhibit a lingual inclination.

Table (3) demonstrates the descriptive statistics for the after 1 year retention group, the upper and lower right and left central and lateral incisors had a labial inclination while the lingual inclination appeared in the rest of the teeth.

Table (2): Descriptive statistics of the (after treatment) group.

| Tooth | Side | No. | Min. | Max. | Mean | SD |
|---|---|---|---|---|---|---|
| **Upper arch** | | | | | | |
| **Central** | Right | 25 | 1 | 16 | 8.16 | 3.659 |
| | Left | 25 | 1 | 15 | 8.08 | 3.465 |
| **Lateral** | Right | 25 | 1 | 12 | 5.72 | 3.129 |
| | Left | 25 | 1 | 12 | 5.64 | 3.012 |
| **Canine** | Right | 25 | –7 | 1 | –2.52 | 2.220 |
| | Left | 25 | –8 | 2 | –2.56 | 2.256 |
| **2nd Premolar** | Right | 25 | –17 | –6 | –9.88 | 3.370 |
| | Left | 25 | –17 | –6 | –9.92 | 3.121 |
| **1st Molar** | Right | 25 | –23 | –2 | –12.96 | 5.481 |
| | Left | 25 | –23 | –2 | –12.84 | 5.226 |
| **Lower arch** | | | | | | |
| **Central** | Right | 25 | –3 | 3 | –0.16 | 1.546 |
| | Left | 25 | –3 | 3 | –0.80 | 1.631 |
| **Lateral** | Right | 25 | –2 | 3 | –0.12 | 1.394 |
| | Left | 25 | –3 | 3 | –0.28 | 1.568 |
| **Canine** | Right | 25 | –14 | –3 | –7.60 | 2.449 |
| | Left | 25 | –13 | –2 | –7.20 | 2.566 |
| **1st Premolar** | Right | 25 | –19 | –10 | –16.00 | 1.958 |
| | Left | 25 | –20 | –14 | –16.52 | 1.661 |
| **1st Molar** | Right | 25 | –30 | –17 | –23.20 | 3.354 |
| | Left | 25 | –30 | –17 | –23.48 | 3.229 |

Measurements in degrees.

Table (3): Descriptive statistics of the (after 1 year retention) group.

| Tooth | Side | No. | Min. | Max. | Mean | SD |
|---|---|---|---|---|---|---|
| **Upper arch** | | | | | | |
| **Central** | Right | 25 | 3 | 17 | 9.44 | 3.874 |
| | Left | 25 | 3 | 16 | 9.36 | 3.763 |
| **Lateral** | Right | 25 | 2 | 14 | 6.48 | 3.151 |
| | Left | 25 | 2 | 14 | 6.40 | 3.122 |
| **Canine** | Right | 25 | –6 | 6 | –1.96 | 2.491 |
| | Left | 25 | –8 | 0 | –2.56 | 1.938 |
| **2nd Premolar** | Right | 25 | –16 | –7 | –9.48 | 2.874 |
| | Left | 25 | –17 | –7 | –9.88 | 3.087 |
| **1st Molar** | Right | 25 | –29 | –2 | –12.76 | 5.495 |
| | Left | 25 | –23 | –3 | –12.96 | 4.895 |
| **Lower arch** | | | | | | |
| **Central** | Right | 25 | –2 | 3 | 0.28 | 1.568 |
| | Left | 25 | –2 | 3 | 0.24 | 1.589 |
| **Lateral** | Right | 25 | –2 | 3 | 0.28 | 1.568 |
| | Left | 25 | –2 | 3 | 0.08 | 1.778 |
| **Canine** | Right | 25 | –17 | –2 | –7.20 | 3.109 |
| | Left | 25 | –14 | –2 | –7.00 | 2.784 |
| **1st Premolar** | Right | 25 | –19 | –11 | –15.56 | 1.917 |
| | Left | 25 | –20 | –13 | –16.24 | 1.899 |
| **1st Molar** | Right | 25 | –30 | –17 | –23.04 | 3.335 |
| | Left | 25 | –30 | –17 | –23.32 | 3.237 |

Measurements in degrees.

The normal torque value (control group) are shown in Table (4) where the upper and lower right and left incisors demonstrate a positive torque while the canines and posterior teeth showed a negative torque values.

Table (4): Descriptive statistics of (control) group.

| Tooth | Side | No. | Min. | Max. | Mean | SD |
|---|---|---|---|---|---|---|
| **Upper arch** | | | | | | |
| **Central** | Right | 25 | –6 | 16 | 5.71 | 4.676 |
| | Left | 25 | –6 | 16 | 5.33 | 4.724 |
| **Lateral** | Right | 25 | –5 | 12 | 5.17 | 4.194 |
| | Left | 25 | –5 | 12 | 4.54 | 3.741 |
| **Canine** | Right | 25 | –10 | 2 | –4.29 | 3.741 |
| | Left | 25 | –11 | 5 | –5.29 | 3.341 |
| **2nd Premolar** | Right | 25 | –13 | 7 | –8.33 | 4.198 |
| | Left | 25 | –15 | 4 | –7.71 | 5.112 |
| **1st Molar** | Right | 25 | –18 | –5 | –10.38 | 3.854 |
| | Left | 25 | –20 | 20 | –9.54 | 7.506 |
| **Lower arch** | | | | | | |
| **Central** | Right | 25 | –5 | 15 | 3.58 | 4.781 |
| | Left | 25 | –5 | 15 | 3.58 | 4.662 |
| **Lateral** | Right | 25 | –6 | 10 | 1.25 | 4.225 |
| | Left | 25 | –6 | 10 | 1.21 | 4.086 |
| **Canine** | Right | 25 | –16 | –3 | –8.17 | 3.435 |
| | Left | 25 | –15 | –3 | –8.29 | 2.911 |
| **1st Premolar** | Right | 25 | –25 | –7 | –18.92 | 4.568 |
| | Left | 25 | –25 | –10 | –18.46 | 3.476 |
| **1st Molar** | Right | 25 | –32 | 15 | –25.33 | 4.459 |
| | Left | 25 | –32 | 0 | –23.88 | 6.873 |

Measurements in degrees.

The analysis of variance (ANOVA) and Duncan's multiple range analysis tests showed a variety of differences in torque values in all teeth in the four involved groups (Tables 5, 6, 7 and 8).

Table (5): Analysis of variance (ANOVA) and Duncan's test among all groups: Upper right teeth.

| Tooth | Group | Number | Mean | F value | Duncan+ |
|---|---|---|---|---|---|
| **Central incisor** | Before T. | 25 | 17.84 | | C |
| | After T. | 25 | 8.16 | | A |
| | After 1 year | 25 | 9.44 | 28.894* | AB |
| | Control | 25 | 5.71 | | A |
| **Lateral incisor** | Before T. | 25 | 11.2 | | B |
| | After T. | 25 | 5.72 | | A |
| | After 1 year | 25 | 6.48 | 8.874* | A |
| | Control | 25 | 5.17 | | A |
| **Canine** | Before T. | 25 | 0.16 | | C |
| | After T. | 25 | –2.52 | | AB |
| | After 1 year | 25 | 1.96 | 7.696* | B |
| | Control | 25 | –4.29 | | A |
| **Second premolar** | Before T. | 25 | –8.08 | | A |
| | After T. | 25 | –9.88 | | A |
| | After 1 year | 25 | –9.48 | 3.872 | A |
| | Control | 25 | –8.33 | | A |
| **First molar** | Before T. | 25 | –10.96 | | A |
| | After T. | 25 | –10.96 | | A |
| | After 1 year | 25 | –12.76 | 1.477 | A |
| | Control | 25 | –10.38 | | A |

Measurements in degrees. + Means with same letter were statistically not significant ($p > 0.05$).

Table (6): Analysis of variance (ANOVA) and Duncan's test among all groups: Upper left teeth.

| Tooth | Group | Number | Mean | F value | Duncan[+] |
|---|---|---|---|---|---|
| **Central incisor** | Before T. | 25 | 17.80 | | C |
| | After T. | 25 | 8.08 | | B |
| | After 1 year | 25 | 9.36 | 30.520* | B |
| | Control | 25 | 5.33 | | A |
| **Lateral incisor** | Before T. | 25 | 10.56 | | B |
| | After T. | 25 | 12.54 | | A |
| | After 1 year | 25 | 6.40 | 7.678* | A |
| | Control | 25 | 4.54 | | A |
| **Canine** | Before T. | 25 | –0.06 | | B |
| | After T. | 25 | –2.56 | | B |
| | After 1 year | 25 | –2.56 | 5.024* | B |
| | Control | 25 | –5.08 | | A |
| **Second premolar** | Before T. | 25 | –9.16 | | A |
| | After T. | 25 | –9.92 | | A |
| | After 1 year | 25 | –9.88 | 1.718 | A |
| | Control | 25 | –7.71 | | A |
| **First molar** | Before T. | 25 | –12.80 | | A |
| | After T. | 25 | –12.84 | | A |
| | After 1 year | 25 | –12.96 | 1.875 | A |
| | Control | 25 | –9.54 | | A |

Measurements in degrees.[+] Means with same letter were statistically not significant ($p > 0.05$).

Table (7): Analysis of variance (ANOVA) and Duncan's test among all groups: Lower right teeth.

| Tooth | Group | Number | Mean | F value | Duncan[+] |
|---|---|---|---|---|---|
| **Central incisor** | Before T. | 25 | 6.24 | | C |
| | After T. | 25 | –0.16 | | A |
| | After 1 year | 25 | 0.28 | 10.772* | A |
| | Control | 25 | 3.58 | | B |
| **Lateral incisor** | Before T. | 25 | 3.68 | | A |
| | After T. | 25 | –0.12 | | B |
| | After 1 year | 25 | 0.28 | 3.310* | B |
| | Control | 25 | 1.25 | | AB |
| **Canine** | Before T. | 25 | –5.52 | | A |
| | After T. | 25 | –7.60 | | AB |
| | After 1 year | 25 | –7.20 | 1.992* | AB |
| | Control | 25 | –8.17 | | B |
| **First premolar** | Before T. | 25 | –14.88 | | A |
| | After T. | 25 | –16.00 | | A |
| | After 1 year | 25 | –15.56 | 8.370* | A |
| | Control | 25 | –14.92 | | B |
| **First molar** | Before T. | 25 | –23.72 | | A |
| | After T. | 25 | –23.20 | | A |
| | After 1 year | 25 | –23.04 | 2.354 | A |
| | Control | 25 | –25.33 | | A |

Measurements in degrees.+ Means with same letter were statistically not significant ($p > 0.05$).

Table (8): Analysis of variance (ANOVA) and Duncan's test among all groups: Lower left teeth.

| Tooth | Group | Number | Mean | F value | Duncan+ |
|---|---|---|---|---|---|
| **Central incisor** | Before T. | 25 | 6.28 | 16.772* | A |
| | After T. | 25 | –0.08 | | C |
| | After 1 year | 25 | 0.24 | | C |
| | Control | 25 | 3.58 | | B |
| **Lateral incisor** | Before T. | 25 | 3.84 | 3.771* | A |
| | After T. | 25 | –0.28 | | B |
| | After 1 year | 25 | 0.08 | | B |
| | Control | 25 | 1.21 | | AB |
| **Canine** | Before T. | 25 | –4.52 | 4.392* | A |
| | After T. | 25 | –7.66 | | B |
| | After 1 year | 25 | –7.06 | | B |
| | Control | 25 | –8.29 | | B |
| **First premolar** | Before T. | 25 | –14.96 | 6.496* | A |
| | After T. | 25 | –16.52 | | A |
| | After 1 year | 25 | –16.24 | | A |
| | Control | 25 | –18.46 | | B |
| **First molar** | Before T. | 25 | –22.60 | 0.321 | A |
| | After T. | 25 | –23.20 | | A |
| | After 1 year | 25 | –23.32 | | A |
| | Control | 25 | –23.88 | | A |

Measurements in degrees.+ Means with same letter were statistically not significant ($p > 0.05$).

## DISCUSSION

A considerable dispersion around the mean torque value measurements in all the teeth was found in the four groups. However, the standard deviations were relatively higher in the pretreatment and control groups. This high standard deviations may be due to biologic variation in the faciolingual axial inclination, variation in facial crown contour and occlusal plane inclination. Andrews[2] considered this dispersion in the range of biological level, while Dellinger[8] reported that this variation was so great that there was no basis to give a specific value for crown torque.

The preadjusted brackets used in the treatment together with the mechanotherapy helped in decreasing the dispersion around the mean reducing the standard deviation in after treatment and after 1 year retention groups. However this dispersion in mean torque value which is reflected as high standard deviations indicated that individual variation should be taken in account when treating our patients (Tables 1, 2, 3 and 4).

In the four groups, there was an increase in the crown lingual inclination in the upper and lower teeth so that each tooth distally had more negative torque value than its neighbor starting from the central incisors towards molars. This is in accordance with other studies[3,8,9,14,19] (Tables 1, 2, 3 and 4).

Comparing means among the four groups showed a significant differences in all teeth with the exception of upper and lower, right and left first molars and upper right and left second premolars (Tables 5, 6, 7 and 8).

The upper right central incisors before treatment group showed a significantly higher labial inclination than other groups followed by the after 1 year retention group, after treatment group and lastly by the control group which had the least labial inclination. Although no significant difference was found between after treatment and control groups which gives an impression that our treatment had managed to decrease the labial inclination of the teeth towards normal this could also be seen in the upper right canines.

The upper right lateral incisor in before treatment group showed a significantly higher positive torque value than the

rest of groups which demonstrated no significant differences among them. This could also be seen in the lower left canine and upper left lateral incisor.

The before treatment group in the upper left central incisor showed a significantly higher labial inclination followed by the after treatment and after 1 year retention group, with no significant difference between the later two group, and then followed by the control group with the least labial inclination.

In the upper left canine, lower right and left first premolar, the control group showed a significantly higher negative inclination than other groups which demonstrated no significant difference among them. Nevertheless, in after treatment and after 1 year retention groups there was an approaching towards normal values (control) group but it was not enough to show a significant difference with the before treatment group.

In the lower right and left central incisors, the control group showed an intermediate inclination between before treatment group in one hand which showed the highest labial inclination and the after treatment and after 1 year retention groups in the other hand.

In the lower left and right lateral incisors, the control group showed no significant difference with the other groups. However, The before treatment group showed a significantly higher labial inclination than the after treatment and after 1 year retention groups.

The lower right canine showed a significant difference between the control and before treatment groups, but after treatment and after 1 year retention groups showed no significant difference with either of them.

It could be seen that using the preadjusted brackets in our treatment managed to reduce the difference in the labiolingual inclination between the before treatment group and control group (which represents the normal torque value) and helped the teeth to align in proper faciolingual inclination which is an important key to get an ideal occlusion.

## CONCLUSIONS

A considerable dispersion around the mean torque measurement represented as high standard deviations were seen in all the teeth in the four groups, however, they were higher in before treatment and control groups. More lingual inclination was seen in distally situated teeth starting from the central incisor toward distally. The analysis of variance (ANOVA) and Duncan's multiple range analysis tests showed that there was a considerable significant difference among the four groups in different teeth. The benefit of using preadjusted brackets was obvious through the reduced labial inclination noted in Class II division 1 treated patients compared with before treatment group. In most teeth the highest positive values were seen in the before treatment group and the lowest were seen in the control group while the after treatment and after 1 year retention group showed an intermediate values in most of the teeth with only few exceptions. This could reflect the effectiveness of using preadjusted brackets in treating orthodontic patients and their ability of getting an appropriate faciolingual inclination which represent an important goal for achieving the desired treatment results.

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