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Adjustable Ve Connecticut İntruzyon Arklarıyla Class II Dıvızyon 2 Tedavilerinin Karşılaştırılması

A Comparison Of Class II Division 2 Treatments With Adjustable And Connecticut Intrusion Arches

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ÖZET

Giriş: Bu çalışmanın amacı, Adjustable intrüzyon arkı (AIA) ve Connecticut intrüzyon arkı (CIA) ile yapılan Sınıf II bölüm 2 tedavilerin sonuçlarını karşılaştırmaktır.**Yöntem:** Bu çalışmaya 24 birey dahil edildi. AIA grubunda 12 ve CIA grubunda 12 hasta vardı. Ölçümler tedavi öncesi (T1) ve tedavi sonrası (T2) lateral sefalometrik röntgen filmlerinden elde edildi. Grup içi karşılaştırmalarda, normal dağılım göstermeyen veriler için Wilcoxon Signed testi kullanılırken normal dağılım gösteren veriler için paired *t*-testi kullanıldı. Gruplar arası karşılaştırmalarda, ortalama tedavi değişiklikleri normal dağılım gösteren veriler için independent t-testi kullanılarak ve normal dağılım göstermeyen veriler için Mann-Whitney U-testi kullanılarak yapıldı. **Bulgular:** AIA ve CIA gruplarında, T1 ve T2 aşamaları arasında, kesici protruzyonu ve overbite için istatistiksel olarak önemli olan değişiklikler gruplar arasında önemli fark göstermedi. **Sonuç:** Bu çalışmanın sonuçlarına göre, AIA ve CIA Sınıf II bölüm 2 tedavisinde benzer etkiler oluşturdu.

Anahtar Kelime: Adjustable İntrüzyon Arkı, Connecticut İntrüzyon Arkı, Sınıf II Bölüm 2 Tedavi

ABSTRACT

Aim: The aim of the study is to compare the results of Class II division 2 **(**Class II/2) treatments with the Adjustable intrusion arch (AIA) and Connecticut intrusion arch (CIA). **Method**: 24 subjects were included in this study. The AIA group had 12 patients, and the CIA group also had 12 patients. The measurements were obtained on Pre- (T1) and post- (T2) treatment lateral cephalometric films. For the intra-group comparisons, a paired *t*-test was used for data indicated normal distribution, while a Wilcoxon Signed test was used for data nonindicated normal distribution. For inter-groups, the average treatment changes were compared by using independent t-test for data indicated normal distribution and the Mann-Whitney U-test for data nonindicated normal distribution**. Results**: In the AIA and CIA groups, between T1 and T2 stages, statistically significant changes for incisor protrusion and overbite did not differ significantly between groups. **Conclusion:** According to the results of this study**,** AIA and CIA produced similar effects in Class II/2 treatment.

Keywords: Adjustable Intrusion Arch, Connecticut Intrusion Arch, Class II Division 2 Treatment

Introduction

Skeletal Class II/2 malocclusion is characterized by the retroclination of the maxillary incisors, decreased lower face height, high lower lip-line, chin prominence, decreased gonial angle, and deep-bite (1,2). In adult period, dental compensation can be a quality treatment alternative for patients with mild to moderate skeletal discrepancies. The extraction of maxillary premolars is often preferred for this reason (3-6). A deep bite can be corrected with incisor intrusion, incisor protrusion, or posterior tooth extrusion (7). To achieve proper gingival exposure, it is better to intrude incisors than to correct a deep bite via the extrusion of posterior teeth in adult patients (8, 9). The first time Burstone used intrusion arch mechanics in the segmented arch technique (10). In the Bioprogressive approach, a Utility arch can be used for lower incisor overbite treatment (11). Moreover, Uribe and Nanda suggested either the Connecticut Intrusion Arch (CIA) (Ortho Organizers, Carlsbad, Calif) or the Connecticut New Arch (CNA) as an intrusion mechanic (5,12). Adjustable utility Intrusion Arch (AIA) **(**Ortho Specialties, St, Hickory Hills, Chicago, USA) is made of nickel titanium anterior segment, the mid-section from stainless steel tube and a posterior segment from stainless steel (13). Previous studies have reported on the efficiency of CIA and Utility intrusion arches during the

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stage of overbite correction (12, 14). However, there was no study on the treatment results for AIA and CIA. Therefore, this study aims to compare the results of Class II division 2 treatments with the AIA and CIA.

Materials and Methods

The study protocol was approved by the ethics review board of the Ondokuz Mayıs University Faculty of Medicine (OMÜ KAEK by decision of no. 2005/97). The power analysis (NCSS 2007 and PASS 2008 statistical software; NCSS, Kaysville, UT, USA) showed that 12 sample from each group were required. The selection criteria of the patients were as follows:

- Angle Class II/2 malocclusion
- A deep bite of at least 4mm
- Post pubertal peak period
- Permanent dentition present
- No missing teeth.

24 subjects were included in this study. One group involved the treatment of 12 subjects using the AIA and was aptly named the AIA group. In addition, the other group also involved the treatment of 12 subjects; however, it used the CIA and was named the CIA group. The AIA group was comprised of 10 females and two males, with a mean age of 17.9 years. The CIA group consisted of 8 females and 4 males, with a mean age of 17.2 years. The mean treatment time was 24± 4 and 26±3 months for the AIA and CIA groups, respectively.

The treatment plan involved the extraction of the first maxillary premolars and maxillary incisor intrusion. 0.018" x 0.025" slot size Roth prescription brackets (Dyna-Lock, 3M Unitek, Monrovia, CA) were bonded to the maxillary arch, while molar bands **(**3M Unitek, Monrovia, CA) with axillary tubes were cemented on the maxillary first molars. 0.016'' x 0.016" AIAs and 0.017''x 0.025" CIAs were inserted in the axillary tubes of the molar bands and the incisor brackets slots. The intrusion stage continued until the overbite measured 0-1mm. The treatment then continued with 0.017"x0.025" Heat Activated Nickel Titanium (HANT) and 0.017"x0.025" stainless steel (SS) full archwires. Class II elastic support was used in the canine retraction and space closure, while lower arch treatment was completed with 0.016" HANT, 0.017''x 0.025" HANT, and 0.017''x 0.025" SS arch**w**ires.

Cephalometric Measurements

The cephalometric study was conducted on the pre- (T1) and post- treatment (T2) lateral, cephalometric films of 24 patients. In this study, the Horizontal Reference Plane (HRP) was drawn at a 7 ° angle to the Sella-Nasion (SN) plane. The perpendicular line drawn from the Sella point to the HRP was used as the vertical reference plane (VRP). The linear (Figure) and angular measurements were obtained.

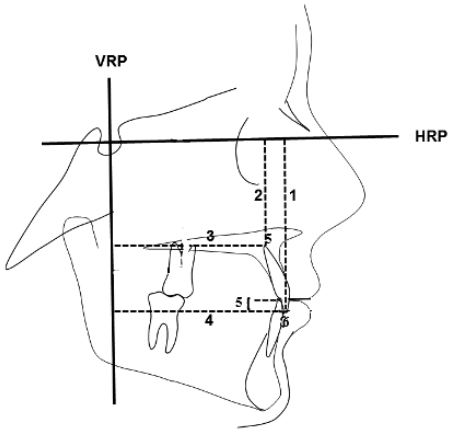

Figure. The linear measurements. (1) Mx1tip -HRP; distance between the maxillary central incisor (Mx1) tip and HRP. (2) Mx1apex -HRP; distance between the Mx1 apex and HRP. (3) Mx1apex -VRP: distance between the Mx1 apex and VRP. (4) Mx1tip -VRP; distance between the Mx1tip and VRP. (5) OB; Overbite. (6) OJ; Overjet.

Statistical Analysis

Intra-examiner reliability was determined by repeating each measurement twice with at least two weeks between measurements. Correlation analysis provided r = 0.96 for angular and r = 0.98 for linear measurements. Random error was calculated and found not to exceed ± 0.7° for angular measurements and ± 0.5 mm for linear measurements.

The normality test of Shapiro-Wilks and Levene's variance homogeneity test was applied to the data. For the intra-group comparisons (T1 vs T2), a paired *t*-test was used for data indicated normal distribution, while a Wilcoxon

Signed test was used for data nonindicated normal distribution. For inter-groups, the average treatment changes (T_2- T_1) were compared by using independent t-test for data indicated normal distribution and the Mann-Whitney U-test for data nonindicated normal distribution**.** T-test was made in % 95 confidence interval of the difference. Statistical analyses were performed using the SPSS software for Windows (version12.0, SPSS, Chicago, Ill). The level of significance for all tests was set at P < .05.

Results

Intragroup Comparison

In the AIA group, there were statistically significant differences between the T1 and T2 stages for the angle between long axis of the maxillary central incisor and HRP (Mx1-HRP dg) ($p < 0.001$), the Mx1apex –VRP mm ($p < 0.01$), the Mx1tip –VRP mm ($p < 0.001$), and the OB mm ($p < 0.01$) (Table 1).

Table 1. Intragroup comparison of T1 and T2 measurements in the AIA Group.

	T1	SD	T2	SD	T2-T1	P
Mx1tip -HRP (mm)	77.40	9.82	76.60	13.03	-0.79	.050(NS)
Mx1apex -HRP (mm)	49.45	3.79	50.11	3.00	0.65	.233(NS)
Mx1-HRP (°)	91.25	7.22	107.58	107.58	16.33	.000***
Mx1apex -VRP (mm)	62.85	4.94	60.02	4.23	-2.82	.001**
Mx1tip -VRP (mm)	63.18	4.91	67.00	6.30	3.81	.000***
OL-HRP (°)	9.04	3.73	8.08	3.63	-0.95	.265(NS)
OB (mm)	5.73	1.95	2.52	0.86	-3.20	.002**
OJ (mm)	1.86	1.03	1.84	0.78	-0.02	.944(NS)

** $p < 0.01$
*** $p < 0.001$
NS indicates no statistically significant difference.

In the CIA group, there were statistically significant differences between the T1 and T2 stages for the Mx1apex-HRP mm ($p < 0.01$), the angle between long axis of the maxillary central incisor and HRP (Mx1-HRP dg) ($p < 0.01$), the Mx1tip –VRP mm ($p < 0.01$), the Mx1apex –VRP mm ($p < 0.001$), and the OB mm ($p < 0.001$) (Table 2).

Table 2. . Intragroup comparison of T1 and T2 measurements in the CIA Group.

	T1	SD	T2	SD	T2-T1	P
Mx1tip -HRP (mm)	75.67	4.04	75.73	4.56	0.05	.939 (NS)
Mx1apex -HRP (mm)	48.95	3.55	51.06	4.05	2.11	.009**
Mx1-HRP (°)	92.50	8.86	109.08	7.97	16.58	.001**
Mx1tip -VRP (mm)	64.85	5.02	68.68	7.25	3.83	.001**
Mx1apex -VRP (mm)	63.60	5.87	58.96	5.01	-4.64	.000***
OL-HRP (°)	6.95	3.81	8.00	4.95	1.04	.298 (NS)
OB (mm)	7.32	2.10	2.62	1.04	-4.70	.000***
OJ (mm)	2.24	1.26	1.65	0.62	-0.59	.232 (NS)

** $p < 0.01$
*** $p < 0.001$
NS indicates no statistically significant difference

Intergroup Comparison

There were no statistically significant differences between the AIA and CIA groups (Table 3).

Table 3. Intergroup comparison of differences T2-T1.

	AIA T2-T1	sd	CIA T2-T1	sd	P
Mx1tip -HRP (mm)	-0.79	3.64	0.05	2.57	.234(NS)
Mx1apex -HRP (mm)	0.65	1.80	2.11	2.32	.100(NS)
Mx1-HRP (°)	16.33	7.80	16.58	12.90	.955(NS)
Mx1apex-VRP (mm)	-2.82	2.30	-4.64	3.28	.131(NS)
Mx1tip - VRP (mm)	3.81	2.19	3.83	3.10	.988(NS)
OL-HRP (°)	-0.95	-0.95	1.04	3.30	.125(NS)
OB (mm)	-3.20	1.81	-4.70	2.40	.093(NS)
OJ (mm)	-0.02	1.40	-0.59	1.64	.483(NS)

NS indicates no statistically significant difference.

Discussion

In this study, the treatment plan involved the extraction of the maxillary first premolars and incisor intrusion. The treatment began with the segmental intrusion of maxillary incisors. In cases where the 0.017’’x 0.025” CIA cannot be started, the maxillary incisors are first leveled. The treatment then continued with 0.017"x0.025" Heat Activated Nickel Titanium (HANT) and 0.017"x0.025" stainless steel full archwires. Class II elastic support was used in the canine retraction and space closure, while lower arch treatment was completed with 0.016" HANT, 0.017’’x 0.025” HANT, and 0.017’’x 0.025" stainless steel archwires. The leveling and aligning, space closure, and finishing stages proceeded with the straight wire appliance.

Class II/2 treatment with maxilary first premolar extraction requires palatal root torque at the maxilary incisors (15, 16). For this purpose, 0.016’’ x 0.016” AIA and 0.017"x 0.025" CIA were inserted into the bracket slots. The torque values for the 0.018" slot Roth brackets of the central and lateral incisors were 12° and 8°, respectively. A small gap between the intrusion arch and the bracket slot increases the likelihood of achieving the effective intrusion of the incisors. The value of the 0.016" x 0.016" wire in slot 0.018” was 17.1˚, while the value for the 0.017’’ x 0.025” wire was 4.7˚ (17). In our study, the Mx1apex-VRP distance was used to evaluate root movement and decreased significantly more in the CIA group compared to the AIA group. This can be explained by the fact that the CIA, which contains a larger cross-section of 0.018" slot brackets, produces more palatal root torque in the upper incisors.

In the literature, the palatal, horizontal, and SN planes were used to measure the amount of intrusion (18, 19, 20). Otto et al. used the distances between the apex of the maxillary incisors and the palatal plane to measure the amount of intrusion (21). Furthermore, in the literature, the maxillary incisor intrusion, which is routinely available, is reported to be approximately 1.5 mm (22). In this study, the Mx1tip-HRP distance was used as intrusion measurement and decreased by 0.79 mm in the AIA group and 0.05 mm in the CIA group. Whereas the over-bite decreased by 3.2 mm in the AIA group and 4.7 mm in the CIA group. This result was linked to treatment with continuous archwires and Class II elastics following intrusion stage. Class II elastic application may steepen the occlusal plane and obliterate the intrusion effect (23). In this study, the occlusal plane slope in the AIA group decreased by the end of the treatment, and the increase in the CIA group was consistent with this result.

At the end of treatment, the Mx1-HRP angle increased by 15.9˚ in the AIA group and 16.7˚ in the CIA group. Similarly, in the treatment of Class II/2, the maxillary incisor angles increased by 14.6˚ in the study by Parker et al. and by 13.8˚ in the study by Kinzel et al. (7, 18). This result was showed that the decrease in overbite was caused by protrusion rather than intrusion of the maxillary incisors in both groups.

Conclusion

AIA and CIA produced similar effects in the Class II/2 treatment with maxillary incisor intrusion and maxillary premolar extraction.

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