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Evaluation of Facial Profile Pleasantness in Patients with Class II Malocclusion Treated with Intermaxillary Elastics

Avaliação da Agradabilidade do Perfil Facial em Pacientes com Má Oclusão de Classe II Tratados com Elástico Intermaxilar

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Abstract

This study evaluated the facial profile pleasantness in Class II patients treated with intermaxillary elastics associated with fixed orthodontic appliance. The sample consisted of 54 cephalograms of 27 Class II patients treated by corrective orthodontics associated with intermaxillary elastics, being 10 males and 17 females, initial mean age 12.84. An album was assembled with the facial profile silhouettes from the initial and final cephalograms of each patient. Two groups of evaluators, one composed of 60 orthodontists (OG); 32 women and 28 men mean age of 37 years, and the other group with 60 lay individuals (LG); 31 women and 29 men mean age of 34.4 years judged the pleasantness of the facial profile. Each sheet of the album presented the profiles of pre-treatment (T1) and post-treatment (T2) silhouettes randomly inserted. Each evaluator received the album and, using the Likert scale, performed subjective analysis of the pleasantness of the patients' facial profile. Comparisons of scores between T1 and T2, between lay individuals and orthodontists, between the evaluators' sex and age was performed by the *t* test at a significance level of 5%. Pleasantness scores assigned to the T2 profiles were significantly higher. When comparing the perception of lay individuals and orthodontists, in T2, orthodontists assigned significantly higher scores. The treatment of Class II malocclusion with intermaxillary elastics had a positive impact on the facial profile pleasantness, perceived by the evaluators regardless of being laymen or orthodontists.

Keywords: Malocclusion, Angle Class II. Orthodontics, Corrective. Esthetic.

Resumo

O objetivo desta pesquisa consistiu em avaliar a agradabilidade do perfil facial em pacientes Classe II tratados com elásticos intermaxilares associado ao aparelho ortodôntico fixo. A amostra constituiu-se de 54 telerradiografias (pré e pós tratamento), de 27 jovens brasileiros, sendo 10 do sexo masculino (37,04%) e 17 do sexo feminino (62,96%) com média de idade inicial de 12,84 anos. O grupo de avaliadores foi composto por ortodontistas, sendo 32 mulheres (53,3%) e 28 homens (46,7%) com média de idade de 37,0 anos e por leigos, sendo 31 mulheres (51,7%) e 29 homens (48,3%) com média de idade de 34,4 anos. Cada avaliador recebeu um álbum contendo os perfis das silhuetas dos pacientes sendo dois perfis em cada folha (pré-T1 e pós-tratamento T2 do mesmo paciente) inseridos aleatoriamente. Realizaram uma análise subjetiva das silhuetas dos álbuns de acordo com a agradabilidade do perfil facial por meio da escala Likert. Para as comparações dos escores entre T1 e T2, entre Leigos e Ortodontistas, entre o gênero e idade dos avaliadores, foi utilizado o teste t com nível de significância de 5%. Os resultados revelaram que houve diferença estatisticamente significante entre T1 e T2, sendo que em T2 os avaliadores atribuíram notas maiores. Na comparação entre a percepção dos Leigos e dos Ortodontistas observou-se diferença estatisticamente significante na fase T2 sendo que os Ortodontistas atribuíram maiores notas. Assim, conclui-se que na percepção dos avaliadores, o tratamento da Classe II com elástico intermaxilar promoveu impacto positivo na agradabilidade do perfil facial.

Palavras-chave: *Má Oclusão Classe II de Angle. Ortodontia Corretiva. Estética.*

1 Introduction

Currently, esthetics is the most frequent reason in the search for orthodontic treatment, and there has been increasing investigation of factors that influence the facial balance and may affect the harmony. Improving the facial esthetics is one of the goals of orthodontic treatment, since the changes in facial profile may occur due to factors as tooth movement and facial growth.[1,2]

Facial analysis is fundamental for a successful orthodontic diagnosis and is an excellent resource aiding the professional to plan the orthodontic treatment addressing the facial esthetics, which is one of the patients' chief complaints . Therefore, several analyses have been developed to evaluate the facial profile; some are obtained from lateral cephalograms, others from clinical examination, or even by photographs evaluation.[3-7]

Due to the high prevalence of Class II malocclusion[8], there are several clinical and scientific evidences related with the different treatment protocols of this malocclusion. There is abundant literature investigating the action mechanisms and the mechanics effects with extraction of two or four premolars, utilization of intermaxillary elastics, therapeutic approach with intraoral and extraoral distalizers, and orthopedic/functional appliances aiming at the correction of Class II malocclusion[9-16].

However, most studies analyze the dentoskeletal changes, ignoring the effects on the facial soft tissue.[10,12,17,18]

One of the most employed resources for the treatment of Class II malocclusion concerns the use of intermaxillary elastics. Application of the elastic force as a resultant directly on the arches promotes dentoalveolar effects.[10-12,17] According to the literature, the effects most frequently reported in the literature are: extrusion of maxillary incisors,[11] extrusion of mandibular molars with clockwise rotation of the occlusal plane[12], increase of LAFH[11-14,19] and buccal inclination of the mandibular incisors.[11,17] The horizontal component of the force applied by intermaxillary elastics on the treatment of Class II malocclusion favors the correction in anteroposterior direction, since it promotes mesial movement of mandibular teeth.[12,18]

In a recent systematic review[15] about the treatment of Class II malocclusion with intermaxillary elastics, the authors concluded that the change promoted by this therapeutic protocol are more effective in the mandibular arch. The tendency to compensate for the mandibular deficiency and correct the malocclusion promotes mesialization and protrusion of mandibular teeth, consequently this effect might influence the improvement in the facial profile.

However, studies on the facial profile produced by this treatment protocol are still scarce, mainly when these effects are subjectively analyzed. This type of analysis is extremely important considering the lay individuals' and orthodontist' opinion since the focus of orthodontic treatment should be the patient's complaint. Thus, this study evaluated the changes in the facial profile of individuals with Class II malocclusion treated by corrective orthodontics associated with intermaxillary elastics, from the lay individuals' and orthodontists' standpoint.

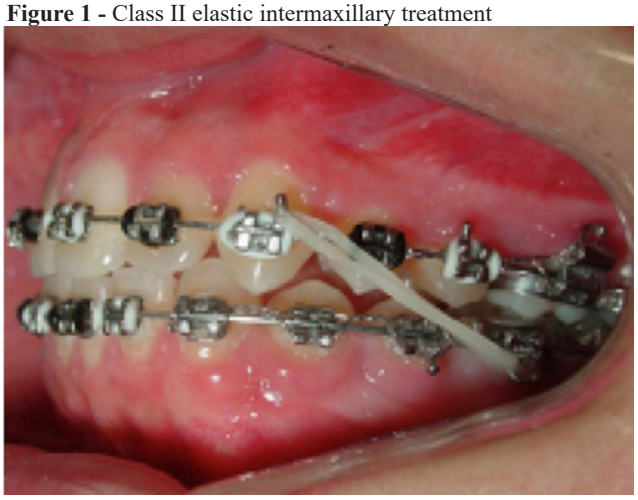
2 Material and Methods

This retrospective study was approved by the Institutional Review Board of Comite de Etica da Unopar (CAAE n. 2.402.416).

The following inclusion criteria were considered for the sample selection: patients presenting initial and final lateral cephalograms; presence of bilateral Class II division 1 malocclusion; absence of hypodontia or permanent teeth loss, except for the third molars; absence of supernumerary or impacted teeth or presenting anomalies of size and/or shape; absence of mandibular crowding; convex facial profile; and increased overjet.

The patients were treated in post-graduate studies orthodontic clinics. The treatment protocol included fixed orthodontic appliances associated with intermaxillary elastics for correction of Class II malocclusion. All the patients were treated with brackets prescription Roth, slot 0.022" x 0.030", Morelli (Sorocaba, SP – Brazil). During alignment and leveling, the following sequence of archwires was used: 0.014" Niti, 0.016" Niti, 0.018" stainless steel, 0.020" stainless steel, 0.017"x0.025" stainless steel and 0.019"x0.025" stainless steel. The deep bite was corrected using stainless steel archwires with accentuated and reversed curve of Spee. Utilization of the intermaxillary elastics was initiated on the 0.017"x0.025" stainless steel archwire. Intermaxillary elastics diameter 3/16" and 1/4" (Morelli) were used, producing an approximate force of 150g, with prescription of continuous use and change every two days (Figure 1).

Figure 1 - Class II elastic intermaxillary treatment



Source: The authors.

The soft tissue profile tracings were obtained from pre- (T1) and post-treatment (T2) lateral cephalograms for each patient, by a single investigator (J.M.) in a dark room to facilitate the anatomical structures identification. The soft tissue outline was traced with 0.5 mm HB pencil on a Ultraphan paper sheet with 0.07-mm thickness and 17.5-mm width and length, adapted on the 54 cephalograms. The tracings were scanned and transferred to a computer, and the facial profile silhouettes were filled on the software Adobe Photoshop CC2018* (Adobe Systems, San Jose, USA) by a single computer technician.

Sample size calculation was performed based on the study of Paula et al.[17] According to this study, a sample size of 27 patients would be necessary per group to achieve a power of 86% to detect a minimum difference of 5% in the preference between lay individuals and orthodontists, with a standard deviation of the difference between lay individuals and orthodontists of 8.3% and a significance level of 5%. To calculate the number of examiners, comparison was performed by a paired model, at a significance level of 5% and power of 80%, detecting a minimum difference of 0.5 point between the 2 groups, requiring a minimum size of 51 examiners in each group.

The two profile silhouettes (T1 and T2) of each patient were randomly inserted on the same sheet, i.e. the pretreatment profile could be on the right or left of the page, producing an album with the 54 silhouettes of the 27 patients. Two groups of evaluators participated in the study to score the profiles of each patient. The group of orthodontists (OG) included 60 specialists, 32 females (53.3%) and 28 males (46.7%),

mean age of 37 years. The group of lay individuals (LG) was composed of 60 individuals without any knowledge in dentistry, 29 males (48.3%) and 31 females (51,7%), with mean age of 34.4 years.

Each evaluator received the album containing the patients' profile silhouettes, and instructions on how to fill out the pleasantness scores. The examiners were requested to score the facial profiles A (T1) and B (T2) using a Likert scale, as follows: 1- very unpleasant, 2- unpleasant, 3- acceptable, 4- pleasant and 5- very pleasant. Therefore, the examiner should write an "x" on the corresponding box for both profiles.

The 54 profile silhouettes were re-examined by 30% of lay individuals and 30% of orthodontists, randomly selected, three weeks after the first evaluation to investigate the intra-examiner error.

2.1 Statistical analysis

The intra-examiner agreement was analyzed by the Intraclass Correlation Coefficient (ICC), and the interpretation followed the values suggested by Fleiss[20].

All measurements passed the Kolmogorov-Smirnov normality test. Comparisons within each group of examiners between T1 and T2 were performed by the paired t test. Comparison of scores assigned between lay individuals (LG) and orthodontists (OG), between the examiners' sex and age were performed by the t test. The proportion of the examiners' sex in each group was compared by the chi-square test.

All the statistical procedures were performed on the software SPSS version 25, at a significance level of 5%.

3 Results and Discussion

According to the intraclass correlation coefficient (ICC), the values obtained for the intra-examiner agreement was 0.42 for lay individuals and 0.57 for orthodontists, both considered satisfactory.

The sample consisted of 27 individuals (10 male and 17 female) initial mean age of 12.84 years old and final mean age of 15.52 years old. The mean overjet was 5.95mm with ANB 6.21° (Table 1).

Table 1 - Sample characteristics

Initial Characteristic (T1)			
Gender	Male	n	10
		%	37.4
	Female	n	17
		%	62.96
Initial age	mean		12.84
	sd		2.09
Final age	mean		15.52
	sd		2.35
Treatment time	mean		2.70
	sd		0.66
Overjet	mean		5.95
	sd		2.09
SNA°	mean		83.79
	sd		2.88
SNB°	mean		77.58
	sd		3.56
ANB°	mean		6.21
	sd		2.03

Source: The authors.

The patients were evaluated by 120 examiners divided into 2 groups (Table 2). The Orthodontists Group (OG) had mean age of 34.4 years old within 31 female and 29 male observers. On the other hand, the lay individuals' groups (LG) had mean age of 37 years old, 32 female and 28 male observers.

Table 2 – Evaluator groups according to age and gender

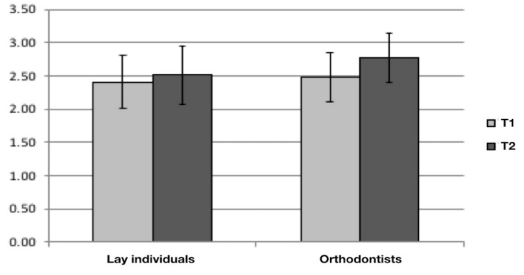
Evaluator	Age				Female		Male		
	Mean	SD	Min.	Max.	n	%	n	%	
Lay individuals	34,4*	10,6*	17*	55*	31+	51,7+	29+	48,3+	
Orthodontists	37,0*	8,4*	23*	66*	32+	53,3+	28+	46,7+	

* p = 0,140 ns. + p = 0,855 ns

Source: The authors.

The means score and standard deviation for both groups are shown in Figure 2. Thus, Orthodontists attributed a higher score not only for the pre-treatment (T1) but also for the post-treatment (T2), when comparing with lay individuals.

Figure 2 - Lay individuals and Orthodontists mean scores and standard deviation in T1 and T2



Source: The authors.

Table 3 shows that both groups (OG and LG) attributed a higher score for T2 facial profile (2.51 and 2.78 respectively). Moreover, note that the Orthodontists were more critical than the lay individuals regarding facial esthetics in both time intervals.

Table 3 – Comparison between T1 and T2 regarding the evaluator groups

Evaluator	T1		T2		dif.	p
	Mean	SD	Mean	SD		
Lay individuals	2,41	0,39	2,51	0,43	0,10	0,001*
Orthodontists	2,49	0,37	2,78	0,37	0,29	<0,001*

* - statistically significant difference (p<0,05)

Source: resource data.

Both groups (OG and LG) scores are compared in Table 4. The result shows that there is statistically significant difference only at T2, with higher scores assigned by the OG.

Table 4 – Intergroup comparison for T1 and T2

Time	Lay individuals		Orthodontists		dif.	P
	Mean	SD	Mean	SD		
T1	2,41	0,39	2,49	0,37	0,08	0,284ns
T2	2,51	0,43	2,78	0,37	0,26	<0,001*

ns - statistically non-significant difference. * - statistically significant difference (p<0,05)

Source: resource data.

The attention to the facial perception of the patient evidences a paradigm shift, in which the decision on the treatment planning, before performed only by orthodontists, is currently increasingly considering the patients' participation. Whenever an orthodontic intervention is needed, the professional is obliged to choose the mechanics which will also improve or at least maintain the pleasantness of the facial profile.[21,22]

Despite dentoalveolar consequences of intermaxillary, Class II treatment is well known in the literature.[9-11,14,16-18] Little attention has been dedicated to its facial profile impact.[15] Therefore, the present study results contribute for a better understanding of facial changes from the orthodontists' and lay individuals' standpoint by comparing pre and post-treatment profile.

Mostly reports available in the literature evaluate the facial perception on photographs of the lower facial third or only of the facial profile,[2,7] or even edited photographs simulating different maxillomandibular positions.[23,24] Nonetheless, such evaluation methods might lead the examinator to consider any other aspects besides the profile itself like gender, age, color of skin, eyes and hair for instance.[1,25,26]

For this reason, the present research used the silhouette evaluation method, eliminating factors that can influence the viewer. Thank to that, facial aspects that must be taken into consideration like the nose size and shape r the interlabial gap are highlighted.[1,22,23,27]

Several quantifying methods can be used to assess the pre and post-treatment facial pleasantness such as visual analogue scale (VAS)[1,25,28] the implicit association test (IAT)[7] or a Likert scale from 0 to 10[24] to evaluate or quantify the facial changes. However, in the present study the 5-point Likert scale was chosen. This method, well acknowledged in the literature, was used in a previous study[26-28] due to its simple and fast application, being easily understood by the examiners.

The present results revealed statistically significant difference between T1 and T2 in the evaluation performed by lay individuals and orthodontists (p=0.001), with higher scores for the post-treatment silhouettes (Table 3). Such result might be considered surprising since the intermaxillary elastic biomechanic effects are restricted to the dentoalveolar area. Despite that, an improvement in the facial profile was observed as well as in studies that asses esthetic facial impact from orthopedic treatment[17,29] or with teeth extraction[21,28].

These results became easier to understand after a search was performed in the regarding which facial characteristics have impacted more in the facial esthetic assessment. Previous studies[27,29] concluded that absence of labial sealing and too much incisors exposure are the main factors associated to low facial profile score. Therefore, the observed improvement in the post-treatment profile can be justified since the orthodontic treatment associated with class II intermaxillary elastic have a positive effect in the relation between teeth and lips,[15,17,30] reducing the incisor protrusion making possible the lips sealing and consequently reducing incisor exposure as well.

Even though both groups of examiners considered the post-treatment silhouette as more esthetically pleasant (Table 4), the observation between lay individuals and orthodontists was different (p=0.001), being more perceptible by orthodontists. corroborating the present results, other studies also revealed differences in the lay individuals' and orthodontists' opinion.[1,21,22,25,27] This is due to the professionals' technical knowledge, since different from lay individuals, the orthodontists were more enthusiastic with the post-treatment results,as they understand the difficulty achieving esthetic changes on the face of patients with Class II malocclusion.

The results in the present study highlight that facial esthetics is not easily understood and Orthodontists should perform this evaluation with extreme wisdom, explaining all the treatment possibilities for the patients, and always considering their opinion, usually more critical concerning post-treatment facial esthetic.

4 Conclusions

From the examiners' standpoint (orthodontists and lay individuals), the treatment of Class II malocclusion with intermaxillary elastics promoted positive results on the facial profile, since the examiners considered the post-treatment profile more esthetically pleasant.

The orthodontists present greater perception of changes in facial esthetics compared to lay individuals, since they assigned higher scores at the post-treatment stage.

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