

A Preferência Estética do Perfil de Indivíduos com Má-Oclusão de Classe II Tratados com e sem Extração

The Esthetic Profile Preferences of Class II Malocclusion Patients Treated with Extraction or non-Extraction

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Abstract

The treatment of Class II can have a positive or a negative impact on the facial profile aesthetic. The present study aims to evaluate the impact of two methods of orthodontic treatment of Class II malocclusion on the facial profile aesthetics. The facial profiles of 46 patients with Class II malocclusion were outlined by radiography before and after treatment; 23 of the patients were treated by the extraction of two maxillary first premolars (EXT group), and the other 23, with the Thurow Appliance (TA group), followed by braces. The profile silhouettes were filled in using the Corel Draw program. An album containing the patient's silhouettes of both groups was created randomly, with two profiles of a patient per page. The preferences of 30 orthodontists, 30 dentists, and 30 laypersons in relation to the profile were recorded along with their perceived differences between the pre-treatment and post-treatment profiles, according to the visual analog scale. All groups of evaluators preferred the post-treatment profile more frequently. There were statistically significant differences in the evaluators' preferences only between the orthodontists' and the laypersons' groups. None of the evaluators' groups indicated substantial differences between the pre-treatment and post-treatment profiles. It may be concluded that both Class II treatment protocols, i.e., the double-extraction of the first premolars and the use of TA, improved the patients' facial profile aesthetics.

Keywords: Face. Malocclusion, Angle Class II. Tooth Extraction.

Resumo

As modalidades de tratamentos da Classe II tem um impacto sobre a estética da face que pode ser positivo ou negativo. O objetivo deste estudo foi avaliar o impacto da estética do perfil facial decorrente de dois tipos de tratamento para a Classe II. Foram traçados os perfis faciais das telerradiografias pré e pós-tratamento de 46 pacientes Classe II, sendo 23 de um grupo tratado com extração de dois primeiros pré-molares superiores e 23 de um grupo tratado com AEB Conjugado seguido de aparelho fixo, e estes traçados foram preenchidos com o programa Corel Draw. Foi montado um álbum com as silhuetas dos pacientes (AEB e EXO) de forma aleatória, sendo dois perfis em cada folha do mesmo paciente. Foi pedido para 30 ortodontistas, 30 cirurgiões-dentistas e 30 leigos para verificarem a sua preferência em relação ao perfil e a quantidade de diferença entre os perfis pré e pós-tratamento, de acordo com a escala analógica visual. Os 3 grupos de avaliadores preferiram o perfil pós-tratamento com maior frequência. Houve diferenças estatisticamente significantes somente entre os grupos de avaliadores ortodontistas e leigos; os 3 grupos de avaliadores indicaram que os perfis pré e pós-tratamento, não diferiram substancialmente. Pode-se concluir que o tratamento da Classe II, com extração de dois primeiros pré-molares, e com o uso do aparelho AEB Conjugado produziu um impacto positivo na estética do perfil.

Palavras-chave: Face. Má Oclusão de Angle Classe II. Extração Dentária.

1 Introduction

Since the beginning of orthodontics, facial analysis has been considered as an important key for not only the accurate diagnosis of malocclusions, but also the success of orthodontic treatment. However, the advent of cephalometry diverted the attention from the facial profile to the arrangement of the skeleton and the teeth, allowing the establishment of quantifiable references of normality at the expense of impairing the facial esthetics. Today, the growing demand for the aesthetics improvement has led orthodontists to seek for a balanced and aesthetic facial profile in addition to a functional

and stable occlusion^{1,3}.

Facial aesthetics is directly related to the facial growth pattern. The most prevalent alteration in patients seeking orthodontic treatment is the skeletal Class II malocclusion, which is characterized by a convex facial profile with maxillary prognathism, mandibular deficiency, or, more commonly, a combination of both factors. Considering the occlusal aspect, this malocclusion is characterized by a dental discrepancy in which the mesial cusp of the upper first permanent molar occludes mesially to the mesial groove of the lower first permanent molar. The negative perception related to the lips protrusion leads many patients to seek orthodontic

treatment. Based on that, the same level of importance has to be given to both, establishment of a functional occlusion and the improvement of the facial profile⁴.

There are various options for the treatment of the Class II malocclusion, making it one of the most studied topics in contemporary orthodontics. The choice of an appropriate treatment must take certain factors into consideration, such as the patient's age and the extent of the esthetic and occlusal impairment^{5,6}. In patients with severe Class II malocclusion, the main complaint is usually related to an increase in the overjet. When the sagittal error is very severe, orthognathic surgery for the repositioning of the bone bases is usually indicated. However, in some cases, the patients reject this possibility, leading the orthodontist to look for another means for Class II correction ensuring the maximum possible improvement in the facial esthetics⁷.

The Thurow Appliance is an excellent alternative for the treatment of Class II patients. Forces between 350g and 500g are considered sufficient to induce orthopedic changes in the jaw by restricting maxillary vertical and horizontal growth, which can improve the patients' facial profile⁵⁻⁹.

Similarly, the extraction of two upper first premolars might be another Class II treatment option with an impact on the patient's facial profile. In order to make sure that the procedure will not adversely affect the patient's facial profile, careful planning is required when choosing to follow this strategy^{7,10,11}.

There is a growing enthusiasm among orthodontists towards non-extraction treatments, in part because of the possibility of poor facial profile results caused by the lip retraction associated to the extraction protocol. The facial profile alteration due to the extraction procedure requires the retraction of the incisors to a great extent, and it is assumed that the soft tissues would accompany this movement. However, the existing literature does not confirm this theory. Moreover, the numerous studies quantifying the response of the soft tissues in relation to the changes in the hard tissues report misleading and conflicting findings. Against this premise, some studies show that the treatments involving extraction, when adequately indicated, promote facial results that are at least as good as those with the non-extraction strategies¹¹⁻¹⁴.

Considering that, it is up to the orthodontist to decide on the alternative that will provide the best functional and aesthetic results for the patient. This retrospective study aims to evaluate the changes in the patients' facial profiles with Class II malocclusion, before and after orthodontic treatment either with the extraction of two maxillary first premolars or using the Thurow appliance (TA) followed by multibracket appliance, from the perspective of orthodontists, dentists, and laypersons.

2 Material and Methods

This study was approved by the Ethics Committee on Research of Sagrado Coração University under protocol number 1.354.052. The study sample consisted of 92 lateral radiographs of 46 young Brazilians of both genders, who were treated at a Private Dental Office by one of the investigators. Sample selection was performed based on the following eligibility criteria: Caucasian patients between 9 to 16 year of age; dentoskeletal Angle's Class II, division 1 malocclusion; bilateral full cusp molar relationship; absence of agenesis or loss of permanent teeth; absence of supernumerary and impacted teeth, and tooth size and/or shape anomalies; absence of inferior crowding or presence of minimal crowding; convex facial profile; and increased overjet (> 5 mm).

The 46 patients were divided into two groups based on the treatment method. It should be mentioned that given the fact that a large overjet and upper lip protrusion were found for both studied groups, either extraction or non-extraction protocol could be employed.

A group (EXT group) of 23 patients (female, 14; male, 9) with Class II malocclusions were treated using orthodontic fixed appliances (0.022-inch Roth prescription), followed by the extraction of two first premolars in the maxillary arch. The initial and final mean ages of this group were 11.5 years and 14.4 years, respectively. The second group (TA group) also included 23 patients (female, 16; male, 7) presenting Class II malocclusion, who were treated using the Thurow Appliance followed by multibracket appliances (0.022-inch Roth prescription). The initial and final mean ages of this group were 9.5 years and 14.5 years, respectively. Other cephalometric information about the sample can be seen at Table 1.

Table 1- Cephalometric measurements of starting forms (T1).

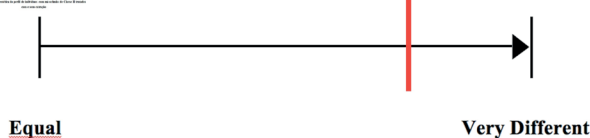
Cephalometric Measurements (T1)	Thurow Appliance Group	Extraction Group
SNA (°)	80.50	84.45
SNB (°)	75.40	76.50
ANB (°)	5.66	6.20
SN, GoGn (°)	34.35	33.57
NS.Gn (°)	69.05	69.63
FMA (°)	25.32	25.85
Overjet (mm)	6.32	6.94

Source: Research data.

After obtaining the patients' radiographs, cephalograms and albums of the facial profile were prepared. All the profile outlines were carried out by a single researcher. Only the soft-tissue profile design was sketched using a 0.5-mm HB graphite pencil on an acetate paper (0.07-mm thick and 17.5-mm wide) used for tracing the radiographs.

The outlines were scanned into a computer, and the profiles were filled in using the Corel Draw software (Corel corporation, Ottawa, Canada). Each patient's pre-treatment and post-treatment profiles were placed on the same page, randomly; in other words, a patient's pre-treatment profile could be on the right or the left side of the same page. Therefore, an album containing the silhouettes of all of the 46 patients belonging to the two treatment groups, EXT and TA, was made (Figure 1).

Figure 1 - Album page with 2 patient's silhouette



Source: Authors.

A total of 90 evaluators participated in the study in order to judge the profile of each patient. The evaluators belonged to three groups based on their proficiency in relation to the field of orthodontics: the orthodontists' group (G1), composed of 30 orthodontic specialists (female, 19; male, 11; mean age, 33.63 years); the dentists' group (G2), composed of 30 dentists with no orthodontic training (female, 22; male, 8; mean age, 28.53 years); and the laypersons' group (G3), composed of 30 people with no dental knowledge, and classified as laypersons in the area (female, 17; 13, male; mean age, 27.6 years). Power analysis showed that considering the three groups of 30 evaluators each and the standard deviation of 11.83% would give an 80% probability of detecting a real difference of 10 points among the groups at a statistically significant level of 5%.

For each of the evaluators an album was provided containing all the patients' profiles, with the pre-treatment and post-treatment profiles of a patient on each page. Along with the album, the evaluators were provided an attachment with the instructions for filling out their responses, and a sheet for recording their evaluations, on which they were required to mark, on the header, the category they belonged to (layman, orthodontist, or dentist) and their sex and age. The evaluators were asked to indicate the profile of their preference (A or B) of each of the patients and the amount of difference perceived between the two profiles according to a visual analog scale (VAS).

The visual analog scale used a 100-mm line (Figure 2), where the marking of the zero on the left end means that the profiles on the same page were not perceived to be different from each other, and the point on the far left end means that the two profiles were completely different. The evaluators were required to mark a vertical line between the left and right ends of the line (Figure. 2).

Figure 2 - Visual analog scale



Source: Authors.

2.1 Statistical analysis

All of the statistical analyses were performed using the Statistica software 7.0 (Statistica for Windows; Statsoft, Tulsa, Ok, USA). In order to verify whether the data presented a normal distribution, the Kolmogorov-Smirnov test was used, and no measurement showed a statistically significant deviation from normality. In order to verify the degree of the similarity between the evaluators' responses with respect to their preferences for the pre or post-treatment profiles in the two treatment groups, analysis of variance was performed (ANOVA) for the results comparison. The statistical differences between the responses of the evaluators' groups were analyzed using the Tukey's statistical test. An independent t-test was applied to determine the evaluator's preference between the treatment methods. ANOVA was performed to quantify the noticeable differences between the pre-treatment and post-treatment profiles in terms of their values, assigned by VAS. The results of the analyses with a P -value ≤ 0.05 and P -value ≤ 0.01 were considered statistically significant.

To determine the method error, the evaluations were repeated with 30% of the evaluators in each group (orthodontists, dentists and laypersons). To assess the preference between the pre-treatment and post-treatment profiles; Kappa coefficient was used to assess the degree of the intra-examiner agreement. The result indicated a satisfactory agreement among the laypersons' (Kappa = 0.39), orthodontists' (Kappa = 0.37) and dentists' (Kappa = 0.39) evaluations.

In order to verify the agreement in VAS scores, the intraclass correlation coefficient (ICC) was performed. The ICC was 0.53 (satisfactory) for the laypersons, 0.54 (satisfactory) for the dentists and 0.57 (satisfactory) for the orthodontists.

3 Results and Discussion

The results showed that all three of the evaluators' groups mostly preferred the post-orthodontic treatment profiles. The comparison results of the evaluators' preferences among the three groups indicated statistically significant differences; the orthodontists' group preferred the post-treatment profiles most often, followed by the dentists, and finally, the laypersons,

regardless of the treatment method.

In the EXT group (Table 2), statistically significant differences were found only between the orthodontists' and the laypersons' groups in their preference of the post-treatment profiles; the post-treatment profile preference values were 81.02%, 76.38%, and 69.72% for the orthodontists, dentists, and laypersons.

Table 2 – Comparison among the three groups of evaluators (ANOVA) for the Extraction treatment method.

Preference %	Orthodontists (G1)		Dentists (G2)		Laypersons (G3)		ANOVA P		
	Mean	SD	Mean	SD	Mean	SD	G1-G2	G1-G3	G2-G3
Pre-treatment	18.98%	12.40	23.62%	8.44	30.28%	12.00	0.24ns	0.00*	0.06ns
Post-treatment	81.02%	12.40	76.38%	8.44	69.72%	12.99	0.24ns	0.00*	0.06ns

Source: Research data.

In the TA Group (Table 3), the results also show a statistically significant difference only between the orthodontists and laypersons in their preference of the post-

treatment profiles; the post-treatment preference values were 85.50%, 80.86%, and 72.90% for the orthodontists, dentists, and laypersons.

Table 3 – Comparison among the three groups of evaluators (ANOVA) for the Thurow appliance treatment method.

Preference %	Orthodontists (G1)		Dentists (G2)		Laypersons (G3)		ANOVA P		
	Mean	SD	Mean	SD	Mean	SD	G1-G2	G1-G3	G2-G3
Pre-treatment	14.50%	10.36	19.14%	11.10	27.10%	16.61	0.34ns	0.00*	0.06ns
Post-treatment	85.50%	10.36	80.86%	11.10	72.90%	16.61	0.34ns	0.00*	0.06ns

* - Statistically significant difference (p<0.05)

ns – No statistically significant difference

Source: Research data.

In a comparative analysis between the EXT and TA groups, the combined values of the preferences of the three groups of the evaluators for the pre-treatment and post-treatment profiles of the EXT group were 24.30% and 75.70%, respectively. In the TA group, the combined values were 20.25% for the pre-treatment, and 79.75% for the post-treatment profiles (Table 4).

The amount of similarities or differences between the pre-treatment and post-treatment facial profiles by VAS were evaluated by ANOVA, in order to verify whether there was a concordance among the mean values assigned by the three groups of examiners.

Table 4 – Preference between the treatment methods (independent t test) for the total number of evaluators.

Groups	Total Evaluators Preference		
	Pre-treatment	Post-treatment	SD
Extraction	24.30%	75.70%	10.02
Thurow Appliance	20.25%	79.75%	13.87
P	0.057ns	0.057ns	

Source: Research data.

In the EXT group, the orthodontists had assigned a mean value of 3.31, dentists, 2.73, and laypersons, 2.41. In the TA group, the orthodontists had assigned a mean value of 4.12, dentists, 3.47, and laypersons, 3.17. According to VAS, the mean of the values assigned by all of the evaluators' groups in the EXT group was 2.82, and that in the TA group was 3.59. The difference between these mean values was not statistically significant (Table 5).

Table 5 – Comparison of VAS values for treatment methods among the three groups of evaluators (ANOVA).

evaluators Treatment method	Orthodontists (G1)		Dentists (G2)		Laypersons (G3)		VAS Value Total	Anova P		
	Mean	SD	Mean	SD	Mean	SD		G1-G2	G1-G3	G2-G3
Extraction	3.31	1.56	2.73	1.31	2.41	1.52	2.82	0.27ns	0.06ns	0.68ns
Thurow Appliance	4.12	1.39	3.47	1.55	3.17	2.04	3.59	0.30ns	0.08ns	0.76ns

ns – No statistically significant difference

Source: Research data.

It was not possible to identify statistically significant differences in the intra-group scores of the evaluators' preferences according to VAS. Despite having mostly preferred the post-treatment profiles, the examiners identified no major differences between the pre-treatment and post-treatment profiles of the patients of the two groups.

Naturally esthetically pleasing facial profiles are exceptions, and do not normally require dental intervention to achieve or maintain the aesthetics. However, once an intervention is required, it is necessary that the professional takes extreme care for the preservation and accentuation of the pleasant characteristics. Lately, the laypersons' perception regarding esthetic appearance has been attributed as much importance as that of the professionals¹⁵⁻¹⁶.

Several studies exploring the effects of orthodontic treatment on the soft-tissue profile have been carried out^{1,2,5,7,11-19}. However, these studies have always focused on the relationship between the positions of the incisors and the lips; the results have, therefore, been restricted to the lower third of the face. Using this method, the facial appearance is not judged as a whole, but as a series of isolated features¹⁴. In the present study, by requesting that the evaluators judged the patients' silhouette before and after the orthodontic treatment, the scope of the results was broadened by taking into account the harmony of the facial profile in general, and not just in specific regions of the face. This form of assessment has been mentioned in literature as effective for this purpose⁵.

The silhouette evaluation allows the elimination of the factors that influence the viewer, such as gender, age, skin color, hairstyle and color, and eye color - factors that might be taken into consideration while evaluating the photographs. Through the elimination of these attributes, the facial aspects to be evaluated, such as the size and shape of the nose or the interlabial gap, are given greater emphasis^{5,17,20,21}.

The data obtained in this study aimed at improving the understanding of the esthetic impact on the patients' profile who underwent premolar extraction, compared to those treated with TA, from the point of view of the dentists, orthodontists, and laypersons. The results revealed that there was a strong preference of all groups for the profile after treatment, irrespective of whether the correction was achieved by means of the TA or the upper premolars extraction.

VAS was employed to quantify the examiners' perception in relation to the amount of the similarities and differences between the pre-treatment and post-treatment facial profiles. This method has been used by several researchers because of its simplicity and easy understanding by the examiners^{5,19,22,23}.

Several studies comparing the patients' soft-tissue profiles with Class II malocclusion post-treatment with and without extraction, used orthodontists and laypersons as evaluators^{2,13,14,16,18}. In these studies, it was observed that the Class II treatment increases the esthetic impact of the patient's face regardless of the treatment approach. In a study

conducted with 120 patients divided into two groups based on the extraction or non-extraction protocol, it was found that the treatment relieves the Class II facial characteristics with a subsequently positive esthetic impact on the patient's face. The researchers noted that the premolar extraction treatment might not result in a less pleasant facial profile than a non-extraction protocol does, as long as the treatment option is adequate. This result was also confirmed by another study¹⁵ assessing the facial impact of orthodontic treatment with the extraction of the upper premolars. They concluded that the therapeutic effect of this treatment, when properly indicated, would be always positive. Their methodology was similar to our study, where the silhouettes of 70 individuals were evaluated by groups of orthodontists, dentists, and laypersons. In both studies, the evaluator groups all preferred the post-orthodontic treatment facial profiles.

In the present study, the orthodontists showed the greatest preference for the post-treatment profiles regardless of the treatment method, implying that a higher proficiency in this specific area allows a greater critical insight. On the other hand, in another study evaluating the effect of the facial profile pleasantness³ using photos of 20 female patients, it was observed that the orthodontists were less critical regarding the facial esthetics. However, the aesthetic impact was evaluated using a result prediction of the pretreatment photos. In contrast, in the present study, the evaluators analyzed the patients post treatment's facial profiles, thus producing a more accurate result. Corroborating the results of this study, other previous studies²⁴⁻²⁶ assessing the facial attractiveness of different growth pattern by employing laypersons and orthodontists as evaluators, it was reported that the professionals are more discerning than the laypersons on scoring disharmonious facial characteristics. However, once again, the methodology used in these previous studies differs from ours, since the previous evaluations were not performed in the patients post orthodontic treatment, despite of using real photographs for evaluation, rather than the simulated ones.

Considering the results of this study, it should be highlighted that the evaluation of the facial profile should be a process of continuous learning for the orthodontists, since the patients are increasingly concerned about the effects that orthodontic treatments might have on their facial harmony. Their opinion as laypersons in the field must always be priority to orthodontic planning.

4 Conclusion

It was concluded that Class II orthodontic treatment either with the extraction of two upper first premolars or with a Thurow Appliance followed by fixed appliances had a positive impact on the patients' facial profiles since the majority of orthodontist, dentists, and laypersons preferred the post-treatment profiles, regardless of the therapeutic approach.

Despite opting for the post-treatment profiles, most of the

evaluators did not identify any significant changes between the pre and post treatment profiles.

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