

Treatment of a Class II Malocclusion with Deep Overbite in an Adult Patient Using Intermaxillary Elastics and Spee Curve Controlling with Reverse and Accentuated Archwires

Abstract

This paper aimed to describe the orthodontic treatment of an adult patient with the following characteristics: asymmetric Class II malocclusion, left subdivision, mandibular midline shifted to the left, mild mandibular anterior crowding, excessive overbite, 4-mm overjet, and a brachycephalic facial pattern. A 31-year-old male patient, treated with fixed preadjusted appliance with Roth prescription, with leveling and alignment NiTi archwire sequence. To correct the asymmetric Class II malocclusion, midline shift as well the overjet and overbite, intermaxillary elastics and accentuated and reversed stainless steel archwires were used, respectively. The posttreatment results showed a Class I molar relationship, as well the overjet and overbite correction. These results could be achieved due to a correct treatment plan and so to the patient cooperation.

Keywords: *Class II, dental occlusion, overbite*

Introduction

Nowadays, dentistry in general and more specifically orthodontics, has seen a mass consumption and it happens due to the socioeconomic changes that have been taking place worldwide and to the growing appeal for favorable self-esthetic standards,^[1] including besides children and adolescents, adult patients who are out of the ideal treatment time. These adult patients often present an extensive list of dental procedures that had been already performed in addition to teeth loss or certain dental features that interferes both in the treatment plan as in the final results and long-term treatment stability.^[2-4]

Class II malocclusion is characterized by the distal mandibular first molar position in relation to the maxillary first molar position, which reflects on adjacent elements, such as soft tissue and other teeth. This malocclusion is one of the most common in orthodontic practice, and its correction – always seeking for the maximum efficiency – can be achieved by several treatment protocols, such as 2 or 4 premolars extraction, maxillary molars distalization, fixed functional appliances, and intermaxillary elastics,

which can be particularly interesting in Class II subdivision cases considering its severity degree and a profile that enable the extraction protocol. In addition to this, intermaxillary elastics are easier to use and adult patients usually collaborate with this protocol.^[5-12]

Maxillary incisors retroclination is one of the most important Class II division 2 malocclusion feature. In this malocclusion, mandibular incisors generally are also retruded and subsequently crowded as well. In the maxillary incisors palatal site, it is common to note that the gum in this area may be subject to trauma due the deep overbite and well-pronounced curve of Spee.^[13]

Deep overbite correction is one of the primary goals of orthodontic treatment.^[14] This malocclusion is characterized by the vertical overbite in the anterior region,^[15] and it is also recurrent in adult patients, either by their growth pattern or by some dental-related factors, such loss of posterior teeth, that can be one of the main etiological factors of this malocclusion. To treat deep overbite, the following orthodontics mechanics can be performed: mandibular and maxillary posterior teeth extrusion, mandibular and maxillary

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anterior teeth intrusion, maxillary clockwise rotation, and curve of Spee flattening. It is important to highlight that at this life period (adult age) the orthodontic treatment stability has a high potential to relapse, due the less ability to adapt perioral muscles and temporomandibular joint to the new dental positions.^[16,17]

As seen above, there are several treatment protocols that are performed to treat the previously mentioned malocclusions. To the related case report, the authors chose intermaxillary elastics as discussed previously in addition with curve of Spee controlling, using reversal and accentuated stainless steel archwires, since it was considered to be a path that would meet the patient esthetic expectations and the orthodontic treatment objectives, which was corroborated by the treatment results that will be shown below.

Diagnosis and etiology

Patient J. C. F, male, 31 years old. Clinical evaluation showed a brachycephalic pattern with oval shape symmetric face, good lip sealing, and slightly convex profile. It was also observed a good maxillary incisors exposure [Figure 1a-d]. This patient also presented three-fourth of Class II malocclusion in the left side, and



Figure 1: (a-d) Pretreatment extraoral photographs

also showed his maxillary incisors retroclined, which is a Class II division 2 characteristic, in this way he was classified as an Angle Class II malocclusion, division 2. He presented a maxillary and mandibular mild crowding and an excessive curve of Spee, with a deep overbite and a 4-mm overjet. Dental midlines were not coincident with the mandibular midline slightly shifted to the left side [Figure 2a-f].

Radiographic examination noted missing maxillary third molars, and the mandibular ones were partially impacted. It was also possible to visualize anterior dental crowding in both arches and preserved alveolar bone crests. Lateral radiography confirmed the brachyfacial pattern associated with marked overbite [Figure 3a and b].

Treatment objectives

Based on the clinical characteristics represented above, the orthodontic treatment objective was the correction of: Class II malocclusion, deep overbite, and the dental midlines shift.

Treatment alternatives

One of the treatment options was correcting the Class II with dental extractions, two maxillary first premolars and two mandibular second premolars, but this orthodontic mechanic would worsen patient soft-tissue profile.

Another option was the use of fixed functional appliances; however, the patient discarded it because it was too expensive.

Treatment progress

To reach these objectives, the following orthodontic mechanics was performed: 0.022'' × 0.028'' preadjusted edgewise appliance with a Roth prescription, with no dental extraction, intermaxillary elastics, and curve of Spee corrections.

Treatment sequence was performed with sequence of rounds archwires (both NiTi and stainless steel) until 0.020'' stainless steel with reverse and accentuated curve of Spee [Figure 4a-c]. After 8 months, dental braces



Figure 2: (a-f) Pretreatment intraoral photographs

could be placed in mandibular teeth [Figure 5a-e]. After correcting the excessive overbite, which was successfully performed with the curve of Spee control, intermaxillary elastics protocol was started. 3/16" intermaxillary elastics with medium force were used to correct the Class II. These intermaxillary elastics were arranged on differently positions during the treatment. At the beginning, it was started with one bilateral elastic all day, being withdraw only for food and oral hygiene, during 6 months [Figure 6a-c]. As soon, Class I relationship in the right hemiarch was achieved, intermaxillary elastics protocol was changed again, to diurnal use of one bilateral elastic and two elastics just in the left side all night long, for 9 months. After that, 5/16" intermaxillary elastics were used to correct the dental

midlines shift. While these elastics protocols were been applied, curve of Spee control was also being performed in the rectangular stainless steel archwires.

After a total 26 months of treatment, all brackets were debonded. A lower fixed 3-3 retainer wire (0.028" stainless steel) was placed, and a maxillary wraparound retainer was delivered to be worn full-time for the 6 months and 12 h/day for the following time.

Based on the clinical and cephalometric data obtained at the end of orthodontic treatment, it can be affirmed that Class I molar and canine relationship were achieved bilaterally, and so the correction of excessive overbite, crowding, dental midline shift, giving to the patient satisfactory facial profile and a pleasant smile [Figure 7a-g].

Results

To achieve the results, cephalometric radiographs (initial and final) were scanned and transformed into digital files, later they were loaded in the Dolphin program, where a single examiner marked the points and cephalometric plans to make the traces to be analyzed [Figure 8].

When comparing pre- and post-treatment cephalometric data [Table 1], it was observed that there were no significant

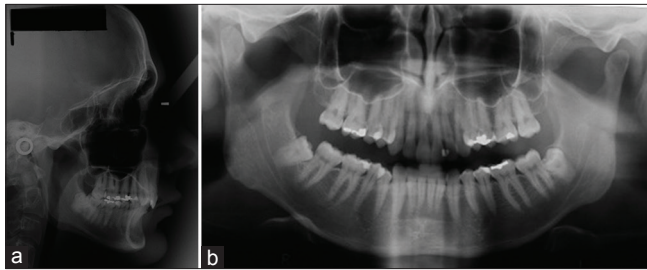


Figure 3: (a and b) Pretreatment radiographs



Figure 4: (a-c) Maxillary placement of fixed appliance

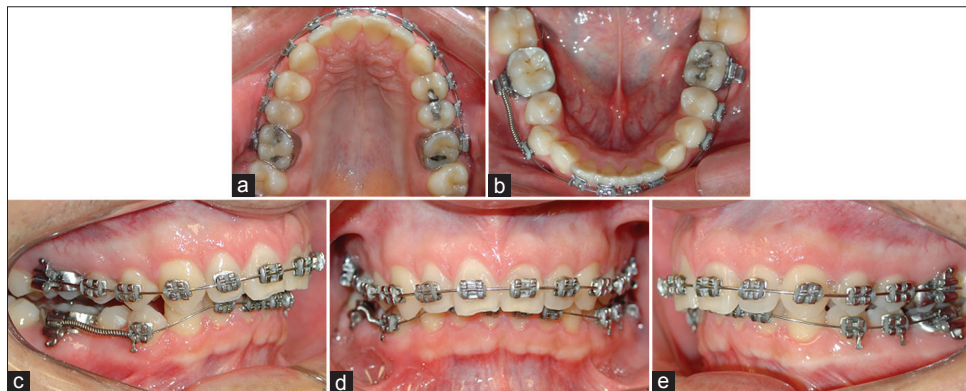


Figure 5: (a-e) After 8 months, appliance placement in the mandibular dental arch



Figure 6: (a-c) Intermaxillary elastics

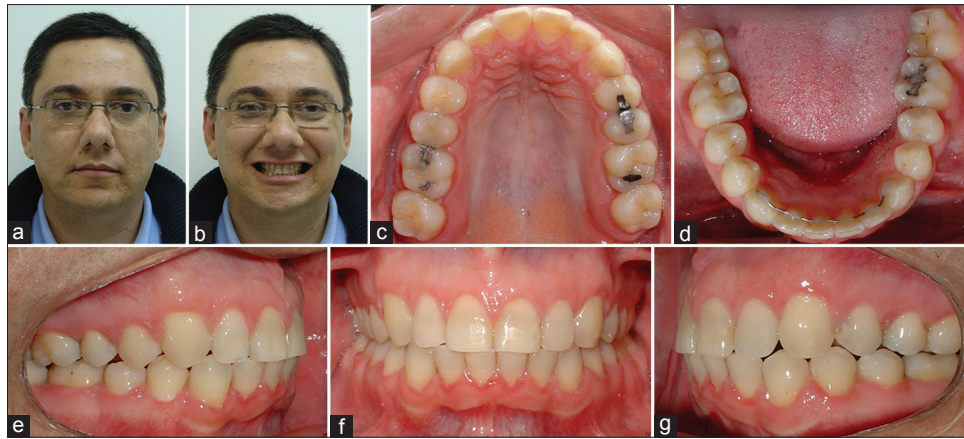


Figure 7: (a-g) Debonding after 26 months

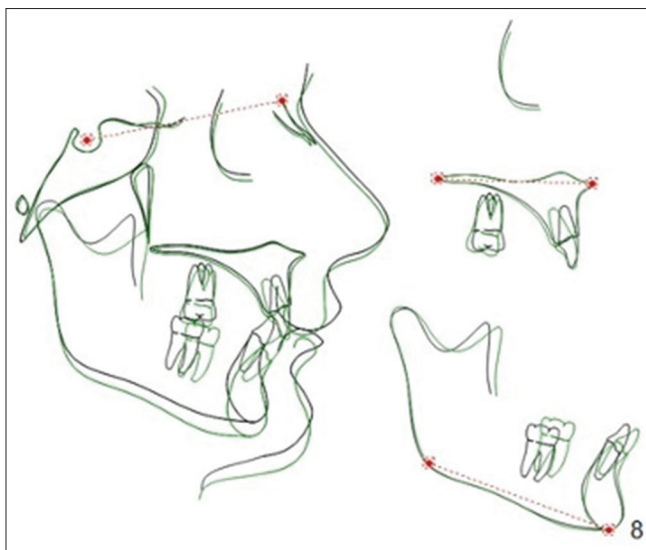


Figure 8: Cephalograms Superimposition

maxillary and mandibular skeletal changes between each other or in relation to the cranial base, although A point was slightly protruded at the end of treatment, whereas in the skeletal relationships, there was an increase in the mandibular plane measurements, consequently increasing the lower anterior facial height and showing a mandibular clockwise rotation.

Evaluating the maxillary teeth positions, an incisors small buccal inclination could be seen, in opposition to their roots that underwent a greater palatal inclination in which it caused a root retrusion too. No vertical changes were observed in these teeth as well. Maxillary molars had a slight distalization and a minor extrusion [Table 1]. Whereas, in the mandible, it could be observed that the incisors had a greater proclination with a bodily protrusion movement. Mandibular molars extruded and mesialized [Table 1]. There was a proclination of maxillary incisors, however, without protrusion, that is, the crown remained in the same buccolingual position, and the root movement was root lingual torque and also correcting the overbite caused an increase in the lower facial height

and this way, patient's soft-tissue profile followed this movement along the nasolabial angle.

In the dental relationship, it could be observed the following changes: molar relationship, reduced overjet and overbite and interincisal angle and in the soft tissue the changes were in the facial convexity, nasolabial angle and there was also a retrusion in the upper lip [Table 1]. There was a Class I correction due to mesial movement of mandibular molars and mandibular incisors proclination. Class II molar correction was accomplished completely by tooth movement, as seen in the literature.

In the follow-up period, the patient was highly cooperative and wore his retainers as recommended [Figure 9a-c]. Therefore, treatment results remained stable 2 years after debonding [Figure 10a-e]. While the patient was in the follow-up period, he did the incisal edges esthetic correction, in another dental professional.

Discussion

One of the considered treatment options were the first maxillary premolars and right second mandibular premolar extractions,^[18,19] applying, this manner the appropriate orthodontic retraction mechanics and this way correcting Class II malocclusion and the left dental midline shift; however, this technique would take as side effect a greater difficulty to control and reduce the deep overbite, allied an unfavorable facial pattern and profile. All these factors advised against this treatment choice, besides the fact that there was not anterior dental protrusion and the patient has a passive lip sealing.^[20] Litt and Nielsen^[21] treated two identical twin brothers with Class II malocclusion and deep overbite, one participant was treated with dental extractions and the other the treatment was performed without extractions and using a headgear, and the final results to both participants was similar to both treatment plans. Uribe and Nanda^[22] treated similar adult orthodontic patients performed with dental extractions (first maxillary premolars) and Connecticut intrusion arch. Some authors also suggest headgear with low traction even in nongrowing patients.^[21,23-25]

Another treatment option in relation to the intermaxillary elastics would be the fixed functional appliances, as some authors^[26,27] recommended. They also obtained Class II malocclusion correction through mandibular incisors proclination and molars extrusion, correcting this way the deep overbite. However, this treatment option was discarded because fixed functional appliances use to be expensive and would also require intermaxillary elastics after their removal.

To treat the excessive overbite, there were the following orthodontic mechanics options: extrusion of posterior teeth, incisors intrusion, a maxilla clockwise rotation, increasing the lower anterior facial height, or even flattening the curve of Spee.^[15] However, despite all possible orthodontic mechanics to treat this type of malocclusion, Parker *et al.*^[14] in their study stated that, although the orthodontics mechanics offers different possibilities and appliances that are possible to use, the effects of them were largely similar to each other.

Table 1 shows that there were no mandibular and maxillary significant skeletal changes between each other or in relation to the cranial base. It happened because it is an adult patient and he was out of growth. This result is compatible with several authors,^[19,25,28] however, another researches^[26,27] found different results, showing a general tendency to maxillary and mandibular mesial movements.

In the skeletal relationships, there was an increase in the mandibular plane measurements, evidencing a lower anterior

facial height increase and a mandibular clockwise rotation, due accentuated and reversed archwires to flattening the curve of Spee, which lead to premolars extrusion, reducing overbite, and consequently increasing facial height, results also compatible with several authors.^[14,19,24,26,29] In the other side, are Ferreira^[28] and Vaughan^[25] that found no great vertical changes in their CDABO case reports.

There was a small maxillary incisors buccal inclination of their crowns, compatible with some authors^[14,24,25] in opposite to their roots, which had a greater palatal inclination. This buccal inclination was due to incisors alignment and leveling effects because they were retroclined. There was no vertical changes in this teeth, differing from another authors, where this change occurred.^[14,24,28] Maxillary molars had a slightly distal inclination, in opposite to Jones *et al.*^[26] where the maxillary teeth had a mesial movements tendency. Maxillary molars also had a small extrusion, due to accentuation and reversal Curve of Spee effects, similar to several papers,^[14,21,24,29] however, Chen *et al.*^[13] performed a deep overbite correction and there were no vertical changes in the maxillary molars.

Mandibular incisors had a great proclination movement coupled with a bodily protrusion, due to the effects of accentuated and reversed archwires and also to the Class II intermaxillary elastics. These results are corroborated by several authors.^[14,21,24,26-28] Mandibular molars also extruded too due to the accentuated and reversal archwires effects and mesialized as well^[14,26,27] due to Class II intermaxillary elastics, in opposite to Ferreira^[28] that found no mandibular molars extrusion.

In the dental relationship, there were the following changes: molar ratio (from 4.00 mm at pretreatment to 2.8 mm posttreatment), overbite (from 6.8 mm to 0.6 mm), and interincisal angle (from 144° to 117°). All these measures showed Class II correction, which was one of the treatment objectives, similar to Parker *et al.*^[14] Vaughan.^[25]

Finally, soft-tissue changes occurred in the facial convexity and nasolabial angle. There was also an upper and lower lip

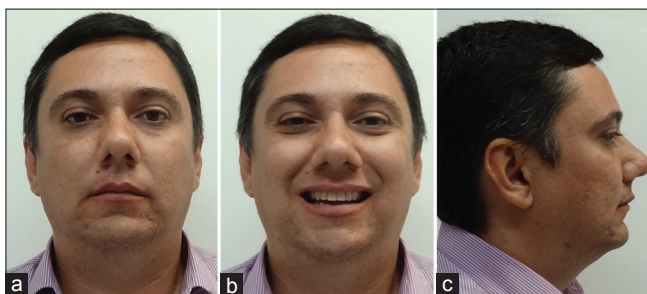


Figure 9: (a-c) Follow-up after 2-year posttreatment

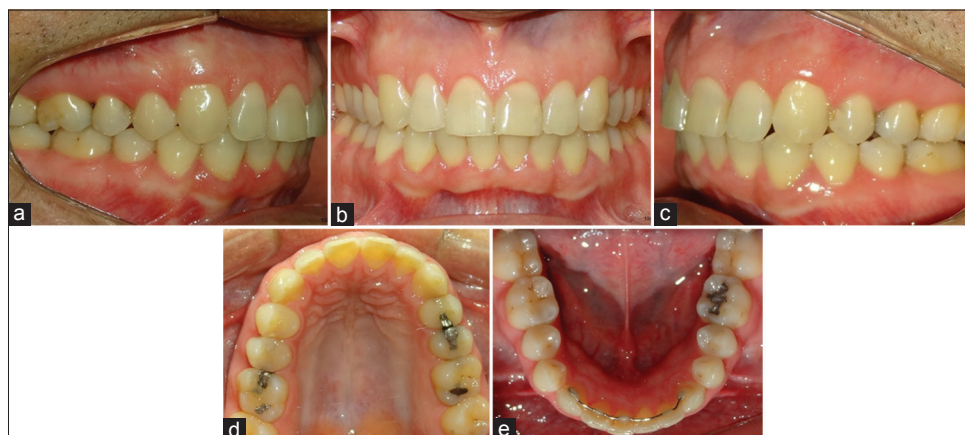


Figure 10: (a-e) Dental aspects after 2-year posttreatment

retrusion in relation to the S line. These changes occurred due to the increase in facial height, to the mild maxillary and mandibular incisors proclination and also to the Class II intermaxillary elastics, results similar to those of Vaughan.^[25]

Conclusion

Although common, the union of Class II malocclusion with excessive overbite in adults, its resolution goes through several paths where orthodontists and patient must be in tune so that the results could be positive at the end of treatment. The decision which orthodontic mechanic must be performed should be decided by the orthodontist after a good treatment planning (patient's clinical and cephalometric characteristics beyond the psychological

profile) since that is no doubt too necessary the participant cooperation in some treatment protocols. When deciding to solve the case with intermaxillary elastics and curve of Spee control with stainless steel archwires, a simple and conservative orthodontic mechanic was chosen, in which subject collaboration was fundamental so that in the treatment end, this choice was effective and favorable results were obtained.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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Table 1: Cephalometric analysis

	Pretreatment	Posttreatment
Skeletal pattern		
SNA (°)	81.0	81.1
(A-Na Perp) (mm)	-2.6	-1.6
(Co-A) (mm)	88.4	87.6
SNB (°)	73.6	74.1
(Pg-Na Perp) (mm)	-14.4	-13.9
(Co-Gn) (mm)	107.7	107.6
ANB (°)	7.3	7.0
FMA (MP-FH) (°)	25.2	25.7
SN - GoGn (°)	28.7	29.0
Y-Axis (SGn-SN) (°)	69.6	71.1
Occ Plane to SN (°)	16.9	20.1
(ANS-Me) (mm)	62.3	67.2
Denture pattern		
1. NA (°)	3.7	17.5
1 - Palatal Plane (°)	98.3	111.7
1 - NA (mm)	-3.2	-2.3
1 - PP (UADH) (mm)	29.7	30.1
6 - PT Vertical (mm)	14.4	12.6
6 - Palatal Plane (mm)	22.4	23.3
6 - SN (°)	78.4	67.9
1. NB (°)	24.9	37.7
IMPA (L1-MP) (°)	99.5	110.4
1 - NB (mm)	3.3	6.3
Md 6 Apex to symphysis (mm)	16.1	13.2
Md 6 Crown to symphysis (mm)	16.5	13.6
6 - Palatal plane UMKC (mm)	25.6	29.1
6 long axis - MP (°)	65.8	70.7
Molar Relation (mm)	4.0	-2.8
Overjet (mm)	4.2	1.7
Overbite (mm)	6.8	0.6
Interincisal Angle (U1-L1) (°)	144.0	117.8
Soft tissue pattern		
Facial convexity (G ² -Sn-Po ²) (°)	19.3	15.1
Nasolabial angle (Col-Sn-UL) (°)	112.6	125.4
Upper lip - S line (mm)	-1.0	-5.2
Lower lip - S line (mm)	-3.6	-5.4
Upper lip to E plane (mm)	-4.4	-8.6
Lower lip to E plan (mm)	-5.8	-7.9

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