

Differential Diagnosis of Skeletal Class II: Orthodontic-Surgical Approach with Surgery First

Diagnóstico Diferencial da Classe II esquelética: Abordagem Ortodôntico-Cirúrgica com Benefício Antecipado

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Abstract

Orthodontic-surgical treatment with the “Surgery First Approach” provides immediate facial aesthetic improvements and significantly reduces the patient’s orthodontic treatment time, avoiding the transient worsening of the facial profile due to dental decompensation that occurs in surgical cases. Thus, this clinical case describes the retreatment of a 22-year-old female leukoderma patient, whose main complaint was related to the proclination of upper and lower incisors. The patient used a mio-relaxing plate for 30 days, which evidenced the skeletal mandibular deficiency and the ½ bilateral Class II malocclusion. Orthognathic surgery first approach associated with the extraction of the 4 premolars was chosen considering the patient’s aesthetic demand. The use of a mio-relaxing plate in the diagnostic stage was essential for the real diagnosis of mandibular deficiency and the technique employed made it possible to conclude the treatment avoiding aesthetic commitment, with excellent results.

Keywords: Malocclusion, Angle Class II. Orthognathic Surgery. Orthodontics, Corrective.

Resumo

O tratamento ortodôntico-cirúrgico por meio do benefício antecipado proporciona melhorias estéticas faciais imediatas e reduz de maneira significativa o tempo de tratamento ortodôntico do paciente, evitando a piora transitória do perfil facial devido à descompensação dentária que ocorre em casos cirúrgicos. Assim, este caso clínico descreve o retratamento de uma paciente com 22 anos de idade, leucoderma, sexo feminino, que apresentava queixa principal relacionada à inclinação vestibular dos dentes anteriores. Após uso de placa mio-relaxante por 30 dias, verificou-se a presença de Classe II esquelética com deficiência mandibular e ½ Classe II dentária bilateral. Considerando a demanda estética da paciente, optou-se pela abordagem ortodôntico-cirúrgica com Benefício Antecipado associada à extração de 4 pré-molares para correção da inclinação dentária anterior. O uso da placa mio-relaxante foi fundamental para o diagnóstico real da deficiência mandibular e a técnica empregada possibilitou concluir o tratamento evitando o comprometimento estético pré-cirúrgico, com obtenção de excelentes resultados.

Palavras-chave: Maloclusão Classe II de Angle. Cirurgia Ortognática. Ortodontia Corretiva.

1 Introduction

The conventional orthodontic-surgical approach in three stages (pre-surgical orthodontics, surgery and post-surgical orthodontics) was widely considered the gold standard procedure, since it was believed to be necessary to obtain stability and removal of dental compensation before surgery¹⁻⁴. However, there are other reports⁴⁻⁷ that point to the possibility of performing surgery before orthodontics to correct skeletal alterations – orthodontic-surgical treatment with Early Benefit.

This modality was only more widespread by means of a case report proposed by Nagasaka et al.⁸ since then, many advantages have been presented with this technique^{9,10}. The treatment uses the principles already established in the dental literature to reverse treatment times, anticipating orthognathic surgery, eliminating or reducing the pre-surgical orthodontic treatment¹¹.

Thus, this method provides immediate facial aesthetic improvements and significantly reduces the patient’s orthodontic treatment time, avoiding the transient worsening of the facial profile due to dental decompensation that occurs in surgical cases¹². However, this procedure requires careful selection of patients and extreme skill in orthodontic-surgical planning, which is why many professionals (orthodontists and oral and maxillo-facial surgeons) still do not feel sufficient safety to perform this approach, with frequent option for conventional surgical preparation¹³.

Thus, the exposed study shows the main aspects related to the early Benefit Technique, as well as it describes and discusses a clinical case performed through this therapy associated with the real diagnosis of mandibular deficiency through the use of mio-relaxing plate.

2 Case Report and Development

2.1 Diagnosis and Etiology

A 22-year-old female patient, D.P., appeared at the dental office with a major complaint related to esthetic nuisance due to the presence of incisors with accentuated proclination. When performing the physical examination, a mild Class II was observed (Figures 1 and 2).

Figure 1 – Extra and intraoral initial photographs (front, left and right-side view)



Source: The authors.

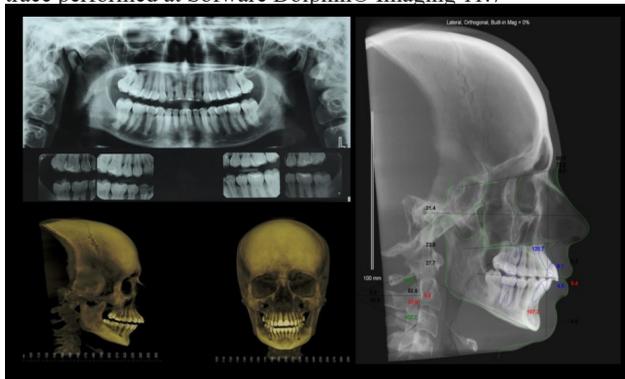
Figure 2 – Initial cast models (front, left and right-side view)



Source: The authors.

The complementary cephalometric analysis showed the presence of upper and lower incisors with excessive proclination, due to a previous compensatory orthodontic treatment performed during their adolescence (from 13 to 15 years of age). In addition, the presence of gingival recession was observed in the lower incisors region, due to the absence of alveolar bone in this region, which was confirmed by means of CBCT (Figure 3).

Figure 3 - Initial Panoramic and interproximal radiographs. Initial face tomographies in front and side view. Cephalometric trace performed at Software Dolphin® Imaging 11.7



Source: The authors.

Also, before the final diagnostic decision, the patient used a mio-relaxing plate for 30 days to verify the real mandibular

position after mandibular deprogramming (Figure 4). The repetition of intra and extraoral photographs showed that the patient made a functional compensation of the mandibular posture, which camouflaged the severity of the skeletal Class II (Figure 5).

Figure 4 - A- Patient with mio-relaxing plate for repositioning the jaw in a centric relation, through the relaxation of the chewing muscles and stabilization of the TMJ. B- mio-relaxing plate made from acrylic resin for mandibular deprogramming



Source: The authors.

Figure 5 – A- Extra and intraoral photographs after using the mio-relaxing plate. B- Increase of overjet after muscle relaxation



Source: The authors.

This set of characteristics obtained during the diagnostic phase led to the resolution of the case through combined orthodontic-surgical treatment.

2.2 Objectives of the Treatment

The objectives of the treatment were (1) correction of excessive proclination of the incisors, (2) correction of skeletal and dental Class II, (3) control of gingival recession, (4) to achieve optimal overjet and overbite, (5) to improve facial and esthetic function.

2.3 Treatment Alternatives

The diagnosis assembling step in model (set-up) was an important resource used in this planning, allowing a three-dimensional preview of the difficulties and limitations of

the case, helping to make decisions on some aspects, such as: exodontics, amount of anchorage loss, extension and type of dental movement, discrepancy in the arch perimeter, discrepancy in the inter-arched dental volume, among others (Figure 6).

Figure 6 - Simulation of surgical orthodontic treatment using the Dolphin® Imaging program 11.7



Source: The authors.

Therefore, several treatment options were considered in order to solve the case, which will be mentioned below:

2.3.1 Compensatory treatment of Class II by means of extractions of two first upper premolar

This treatment option represents an important alternative in the compensatory treatment of Class II patients after growth, with the aim of resolving occlusal problems. However, this possibility was rejected due to the presence of mandibular deficiency and the patient's esthetic complaint.

2.3.2 Compensatory treatment of Class II by means of mandibular advancement with fixed propulsor appliances

Compensatory treatment by means of mandibular advancement with fixed propulsor appliances is an alternative of dental compensation for adults with Class II cases of Angle with moderate severity. However, one of the main side effects of this technique is related to the excessive proclination of the lower incisors. Thus, this hypothesis was rejected, since there was an absence of vestibular alveolar bone in the region of lower incisors and presence of gingival recession¹⁴.

2.3.3 Conventional surgical orthodontic treatment

Conventional ortho-surgical treatment was offered as an option for treatment; however, the patient refused this alternative due to the factors time and worsening of the facial appearance during pre-surgical orthodontic preparation¹⁵.

2.3.4 Surgical-Orthodontic treatment with Anticipated Benefit

This therapeutic alternative was chosen by the patient due to the shorter pre-surgical treatment time and faster esthetic and functional improvement.

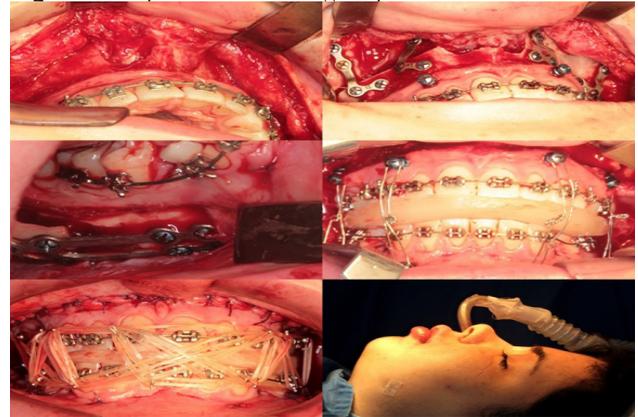
2.4 Treatment Progress

To perform orthodontic-surgical treatment with Early Benefit, the orthodontic appliance Roth Slot 022" (Kirrium

Abzil- 3M OralCare) was bonded in a passive manner with steel wire 0.017" x 0.025" (Orthometric) one week before surgery and impression taking of the upper and lower arches 24 hours before surgery.

In the surgical procedure, extractions of the 4 premolars (2nd upper premolars and 1st lower premolars) were performed. For skeletal discrepancy correction, a 12mm mandibular advance and maxilla rotation were performed for better exposure of upper incisors in the smile (Figure 7). The mandibular advancement was expressive and caused important cephalometric alterations. The decision to extract the 2nd upper premolars was based on esthetic benefit when smiling during the postoperative orthodontic treatment, avoiding exposing the extractions width in the upper arch.

Figure 7 - Sequence of trans-surgical photos



Source: The authors.

An interocclusal surgical guide was made to establish the relationship of fragments during surgery, which remained for 30 days to allow surgical stability. In the postoperative period, in addition to the prescribed medication, guidelines regarding feeding, compression application and hygiene were strictly followed, as well as applications of low extraoral power laser. Thus, this set of care allowed an excellent recovery, with little post-surgical edema (Figure 8).

Figure 8 – A- 5-day Post-operative period. B- Interocclusal guide inserted during surgery and used for 30 days for surgical stabilization



Source: The authors.

Thirty days after the surgery, the postoperative orthodontic treatment began. This stage aimed at: closing the spaces of the dental extractions, aligning the upper and lower arches,

establishing a Class I anteroposterior ratio, adequate overjet and overbite (2mm), coincidence of the dental midlines with the median sagittal plane and esthetic smile (Figure 9).

Figure 9 – A- 30-day Post-operative period



Source: The authors.

Seven months after surgery, the superior retraction mechanics were performed to close the extractions widths and lower retraction with loss of anchorage associated with lower mini-implants (Figure 10).

Figure 10 – A- 7-month Post-operative period



Source: The authors.

After 12 months of orthognathic surgery, the extractions widths were practically closed, on the left lower side a mini-implant was installed to improve dental intercuspation and obtain a Class I ratio, as already established on the right side (Figure 11).

Figure 11 – A- 12-month Post-operative period.



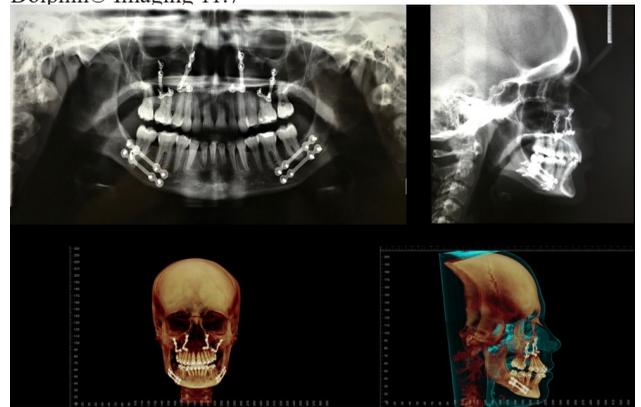
Source: The authors.

2.5 Treatment Results

The objectives of the treatment were achieved, there was a

considerable improvement of the facial and esthetic function, as well as corrections of the dental inclinations. After 24 months of treatment, the smile was already harmonic, dental ratio in occlusion key, adequate *overjet* and *overbite*, coincident mean lines and no remaining spaces after refinement of bends. In addition, the appliance was maintained for another 5 months in the finishing phase using 0.018x 0.025” and 0.019x 0.025” steel wire (Figures 12).

Figure 12 - Panoramic and final tele-radiography. Lateral and frontal view final face tomographies performed at Software Dolphin® Imaging 11.7



Source: The authors.

The cephalometric analysis allowed to evaluate the results obtained through orthodontic-surgical treatment with early benefit. The maxilla maintained the angular measurement before and after treatment (SNA°). Whereas the mandible, due to the 12mm advance, presented a gain of 3° compared to the skull base (initial SNB= 74.6° and final SNB 77.7°). In addition, there was an expressive improvement in the facial profile due to the alteration in the FMA° (initial 20.4 and final 18.7) and ANB° (initial 5.5 and final 2.5) presented (Figure 13).

Figure 13 - Pre-treatment and Post-treatment cephalometric Analysis (ABO)

Tabela 1 – Análise cefalométrica pré e pós-tratamento (ABO)

Variáveis	Norma	Pré- tratamento	Pós-tratamento
Maxilla to cranial base			
SNA (°)	82	80.1	80.2
Mandible to cranial base			
SNB (°)	80	74.6	77.7
SN-MP (°)	32	34.9	34.7
FMA (°)	25	20.4	18.7
Maxillo- Mandibular			
ANB (°)	2	5.5	2.5
Maxillary Dentition			
1-NA (mm)	4	5.8	3.4
U1-SN (°)	101.3	113.8	105.8
Mandibular Dentition			
1-NB (mm)	4	8.6	4.1
L1-SN (°)	95	107.9	101.2
Soft Tissue			
Lower Lip to E Plane (mm)	-2	2.2	-2.7
Upper Lip to E Plane (mm)	0	3.9	0

Source: The authors.

On the other hand, the effects of surgery along with dental extractions favored the dental decompensation in the maxilla

and mandible (1-NA, 1-NB, U1-SN⁰, L1-SN⁰). Therefore, they promoted a decrease in dental angulations, improvement in *overjet*, *overbite*, occlusion and profile. Also in relation to the profile, the final oral photographs (Figure 14) show the obtaining of a straight profile at the end of the treatment, favoring the lip sealing.

Figure 14 – Final front and side extraoral photographs



Source: The authors.

There were no complications after surgery, this favored the patient's satisfaction after the appliance removal. (Figures 14 and 15). The sequence of photos (Figure 16) represents the evolution of the treatment. Images regarding the before and after related to the use of the mio-relaxing plate (Figure 17)

are presented to show the success of the protocol employed.

Figure 15 - Final intraoral photos



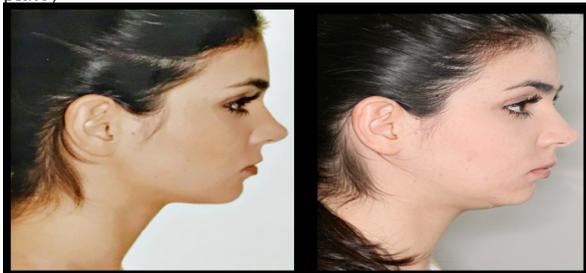
Source: The authors.

Figure 16 - Treatment Evolution



Source: The authors.

Figure 17 – A- Before and After (after using the mio-relaxing plate)



Source: The authors.

A superimposition of tele radiographies (Figure 18) exposes the result of the mandibular advance associated with dental decompensation. The treatment was finalized at 29 months, when final impression takings were performed for retention.

Figure 18 - Tele radiographies superimposition (blue before and orange after)



Source: The authors.

2.6 Discussion

The Early Benefit technique eliminates the conventional orthodontic preparation time, anticipating orthognathic surgery and promoting an improvement in the face esthetic that is one of the most important complaints in these cases, thus, the patient is contemplated in the beginning with the profile improvement. In addition, it avoids discomfort during the period of worsening of the facial aspect caused by dental decompensation of conventional orthodontic-surgical treatments^{10,11}.

As mentioned in other studies¹⁶⁻¹⁸, a great advantage is in reduced treatment time. However, it should be emphasized that, although it does not significantly change the surgical technique, the Anticipated Benefit makes orthodontic treatment more complex, because it requires skeletal anchoring in most cases and requires an orthodontist commitment to achieve the objectives set in the beginning.

The anticipated benefit consists of a procedure where patients selection is critical, planning is fundamental, and safety is needed to perform the skeletal repositioning^{10,11}. The ideal case is characterized by the presence of malocclusion associated with skeletal malformation, moderate to mild dental crowding, upper and lower central incisors with adequate inclination or gently proclined/upright, in addition to minimal cross-sectional alteration^{1,2}.

On the other hand, patients with anterior open bite, marked *Spee* curve, severe crowding, severe negative overjet and need for extensive mandibular setback are not indicated.

This is due to the high risk of recurrence associated with these factors. In these cases, it is recommended to perform alignment and leveling prior to orthognathic surgery, following the conventional orthodontic-surgical protocol^{10,11}.

As already mentioned, some treatment options were offered to the patient and she opted for the Anticipated Benefit due to the shorter pre-surgical treatment time, faster esthetic and functional improvement. In addition, bimaxillary surgery was scheduled due to profile improvement. This choice is in line with a study where the authors stated that in surgical correction of mandibular retrognathism, bimaxillary orthognathic surgery should be considered the treatment of choice instead of pure mandibular advancement, since besides favoring the facial esthetic allows for easier orthodontic correction¹.

Also, in a relevant way, the patient complained about the dental inclinations and gingival recessions. Although the premolar extractions in Class II patients represent a subject widely discussed by orthodontists,^{19,20} it was opted for the combination of orthognathic surgery associated with premolar extractions, due to the fact that the mandibular advancement does not cause damage to the facial profile. In addition, orthodontic movement is favored due to the transient osteopenia caused by surgery, characterized by the reduction of bone density after a surgical procedure in a given region, which supposedly facilitates the orthodontic mechanics and width closure^{10,11,13}.

At the same time, the use of therapies carried out together for the success of treatment is crucial. Among these therapies, the use of low-power laser in the postoperative period helped to achieve a good recovery in a shorter time than usual. Laser presents as main effects pain and edema decrease, tissue repair stimulation, infection prevention, bone bio stimulation and recovery in cases of paralysis and paresthesias^{21,22}.

Mio relaxing plate, which is also indicated in Class II patients with mandibular retrognathism, favors the correct positioning of the temporomandibular joint disc^{23,24}. In this case, it was essential to use to visualize the patient's actual problem, since the previous patient's muscular posture camouflaged the actual mandibular position.

Currently, choices for surgical treatments do not involve only esthetic issues. Since the surgical procedures are complex, professionals offer, in addition to improving self-esteem, an improvement in quality of life. Thus, mandibular advancement surgeries are very well indicated for patients with sleep apnea and airway problems. In addition, patients with mandibular retrognathism generally present reduced airway volume, and a recent study²⁵ demonstrated that after the surgical procedure, an average increase of 64% was possible. Therefore, more studies with Early Benefit approaches in patients with skeletal Class II and mandibular retrognathism would be of extreme importance.

3 Conclusion

The orthodontic-surgical treatment through the Early Benefit technique enabled the conclusion of the treatment of a skeletal Class II avoiding pre-surgical esthetic involvement, obtaining excellent esthetic and functional results, both facial and occlusal. However, it should be emphasized that even though it is an excellent treatment alternative, it should be very well planned and indicated only in well-selected cases and performed by oral and maxillofacial surgeons and orthodontists with experience and knowledge due to its high complexity.

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