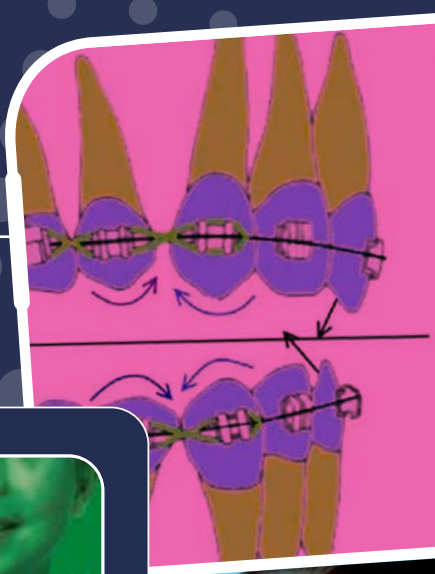
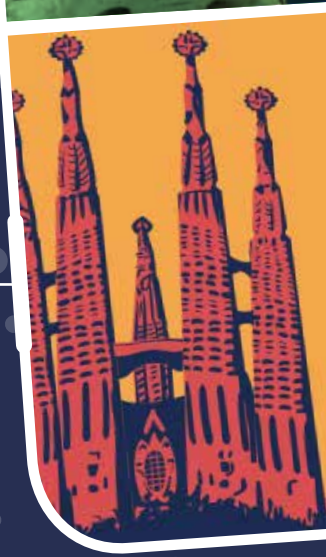
ORTHODONTICS BIOPROGRESSIVE
REVIEW N19 – JUNE 2026



SBR
SOCIETE BIOPROGRESSIVE RICKETTS



SUMMARY

Bioprogressive & principles charter

The bioprogressive method is not merely an orthodontic technique; **it is a comprehensive orthodontic therapeutic approach, with its own philosophy.**

> Primacy is given to diagnosis and to the determination of treatment objectives. These account for approximately 75% of treatment success.

> The clinical examination considers the individual as a whole: morphological, physiological, esthetic, postural, and psychological balance. The concept of the "degree of difficulty" arises from this assessment and guides the practitioner's clinical choices.

> The treatment plan is based on the search for the optimum for each patient, from both functional and esthetic perspectives, rather than on achieving values that conform to predefined "norms."

> Objectives for the dentition, skeletal architecture, and soft tissues through growth predictions and the mounting of study casts on an articulator, according to the degree of difficulty.

> The integration of growth and maturation phenomena — skeletal, dental, and psychophysiological — **makes it possible to treat certain anomalies at an early stage and to unlock growth potential.**

> Patient awareness, motivation, and functional education are part of the first stage of all treatments.

> The design of mechanical systems depends on individualized objectives, the degree of difficulty presented by the dentition, and the functional envelope. It must ensure facial axis stability and three-dimensional control of tooth movements.

> The forces used are light and continuous; **parasitic movements and frictional forces are minimized within a specific segmentation of the arches.**

> The base arch, the keystone of mechanical systems, is not used dogmatically. Its adjustments are reasoned and adapted according to the specific role it plays within the treatment sequence.

> In accordance with these principles, we commit to "improving our patients' quality of life and strengthening their self-esteem by restoring function and enhancing facial appearance; seeking optimal occlusal, esthetic, and functional outcomes for each patient; providing patient care in accordance with ethical principles; and subordinating all our actions to the principles of integrity, innovation, and the pursuit of excellence."

Dear colleagues and friends,

The first half of 2026 has come to an end, marked by seven regional meetings held between January and June, featuring a wide range of outstanding speakers. More than 320 orthodontists and residents attended these events—a clear reflection of the vitality of our Society.

In mid-April, Strasbourg hosted the 20th Inter-University Orthodontic Week, organized by Professors Stéphane Barthélémi and Yves Bolender, bringing together approximately 174 orthodontic residents from across France. It is always rewarding to meet our future colleagues and discuss with them their trai-ning, expectations, and concerns, particularly at a time when the French National Dental Council has broadly portrayed orthodontic specialists as "specialists in fraud" because of the misconduct of two practitioners. At the same time, around ten dental centres have been implicated in an alleged €58 million healthcare fraud involving fraudulent billing.

Should these allegations be confirmed, one can only hope that the Council will respond with the same determination. While the underlying principle of combating fraud is beyond dispute, the manner in which the profession has been portrayed is, to say the least, deeply regrettable. Unsurprisingly, this issue was widely discussed among both residents and faculty throughout the Inter-University Week.

This event is made possible thanks to the financial support of our industry partners, to whom we extend our sincere gratitude.

As always, we have worked on a voluntary basis to produce the journal you are now reading, bringing together scientific articles and clinical case reports from a variety of international contributors. In this issue, Dr. Huy, from Vietnam, presents the biomechanics behind an outstanding clinical case.

Dr. Haj Ibrahim, based in Dubai and partly trained by Professor Duchateaux in Brest, shares a case with long-term follow-up, while Dr. Romy Moison, representing the Western SBR, presents a multidisciplinary case involving orthodontics, physiotherapy, periodontics, and surgery. This naturally leads me to our major event next October.

Our Annual Congress will take place in Barcelona from 2 to 4 October 2026, under the theme: " Orthodontic–Surgical Symbiosis: A New Paradigm."

Renowned international speakers from Japan, Vietnam, Spain, and France will discuss both the current limitations of our discipline and the exciting new therapeutic opportunities now available. The congress is being organized by the South-West Regional Society, with Dr. Rotenberg serving as Scientific Chair. Registration remains open—it is not too late to join us!

On the Friday morning, before the official opening of the congress, we will gather for a tribute to Carl Gugino, together with his friends and colleagues who wish to participate.

The year will conclude with the Journées d'Orthodontie, held as every year in Paris, from 7 to 9 November, during which the SBR will organize two scientific sessions: one jointly with AFOS, entitled "Free the Mandible!", and another in collaboration with CEPOG and CEO, entitled "Temporomandibular Joints in the Face of Evolving Orthodontic Therapies."

These will provide two further opportunities to meet, exchange ideas, and enjoy the unique combination of scientific discussion and professional fellowship that characterizes our Society.
We look forward to seeing many of you in Barcelona and Paris. These gatherings are always marked by friendship, collegiality, and a shared passion for learning. Seeing members of the SBR, our residents, and colleagues from around the world united by this commitment to knowledge remains our greatest reward.

With bioprogressive regards, and wishing you all a wonderful summer holiday!

Patrick
Guézénec
SBR President

Segmental space closure using the bioprogressive technique

in an adult patient with bimaxillary incisor protrusion and incisors positioned close to the cortical bone: a case report

Dr Dao Quang **Huy**

SQODF
Quang Huy Dental Clinic,
Hai Duong (Vietnam)

daoquanghuy260894@gmail.com

ABSTRACT

Objectives

The objective of this clinical case report is to present the effectiveness of treating **bimaxillary incisor protrusion** in an adult patient through extraction of the four first premolars, in order to create space for anterior retraction and thereby improve dental protrusion and facial esthetics.

In addition, this report aims to demonstrate the control of root movement within the limits of the alveolar bone using **Bioprogressive segmental mechanics** in a case with incisor roots positioned close to the cortical plate.

Methods

The patient was treated with extraction of four first premolars in both arches. Treatment was carried out using segmental mechanics based on the Bioprogressive technique. Following initial alignment and leveling, canine retraction was performed first using a segmental loop system. In the subsequent stage, the four incisors were retracted simultaneously using segmental retraction arch mechanics.

Throughout treatment, tooth movement was controlled in three dimensions through bends incorporated into the segmental archwires, including intrusion, tipping, positive torque, and toe-in, to ensure precise and stable tooth movement.

Results

After treatment, dental relationships showed significant improvement, with better incisor inclination and reduction of bimaxillary incisor protrusion. Tooth movement was successfully achieved within the alveolar bone despite the initial proximity of the incisor roots to the cortical plate. A Class I canine relationship was established, and both overjet and overbite were restored to physiological limits.

Lip protrusion was reduced, resulting in improved facial esthetics. Torque control and root positioning were well maintained within the alveolar bone boundaries, with no significant root resorption observed. The treatment outcome was stable both functionally and esthetically.

Conclusions

Segmental mechanics based on the Bioprogressive technique allow effective three-dimensional control of tooth movement, particularly in maintaining root position within the alveolar bone limits and minimizing the risk of contact with the cortical plate during retraction.

Fig. 1
Pre-treatment extraoral photographs.

This approach is especially beneficial in challenging cases where the roots are located close to the cortical bone.
The incorporation of control bends in segmental archwires enables effective management of undesirable side effects, contributing to safe and stable treatment outcomes.

Keywords

Segmental treatment; Bioprogressive mechanics; Bimaxillary incisor protrusion; Space closure loop; Extraction treatment

INTRODUCTION

Bimaxillary dentoalveolar protrusion is characterized by excessive proclination and protrusion of both the maxillary and mandibular incisors and is commonly associated with a convex facial profile [1].

Increased incisor protrusion is frequently associated with lip protrusion, with the lips positioned anterior to the esthetic line (E-line), which may adversely affect facial harmony [2,3]. In addition, mentalis strain may be observed when patients attempt to achieve lip competence at rest [4].

In the orthodontic treatment of adult patients with this condition, extraction of the first premolars is commonly performed to create space for anterior retraction, thereby reducing dentoalveolar protrusion and improving the soft tissue profile [5].

However, space closure may present significant challenges, particularly in cases in which the roots of the anterior teeth are positioned close to, or in contact with, the labial cortical plate. Such anatomical limitations may restrict the extent of tooth movement in the desired direction and increase the risk of iatrogenic sequelae [6]. In addition, approximation of the roots to the cortical plate during orthodontic tooth movement has been associated with an increased risk of adverse effects, including cortical bone dehiscence and external apical root resorption [7].

Segmental orthodontic techniques utilizing Bioprogressive mechanics—such as three-piece retraction loops, segmental retraction arches for the four incisors, and utility arches—enable effective control of unfavorable moments generated during tooth retraction through precisely incorporated control bends.

In addition, these mechanics can produce more physiologic force systems, thereby facilitating efficient tooth movement even in cases with unfavorable initial tooth position [8].

This clinical case was designed with the following objectives:
– to reduce incisor protrusion and improve the soft tissue profile through extraction of four first premolars;
– to control unfavorable moments acting on the anterior segment, particularly torque control, thereby facilitating controlled tooth movement and appropriate root positioning.

CASE PRESENTATION

1. Patient informations

A 24-year-old female patient presented with the chief complaint of protrusion and flaring of the anterior teeth in both arches, resulting in a convex facial profile and negatively affecting her confidence in social interactions.

The patient particularly noticed the pronounced protrusion of the maxillary incisors when smiling. The patient did not report a gummy smile and had no signs or symptoms related to temporomandibular disorders.

2. Clinical examination

Extraoral examination:
Extraoral examination revealed a convex facial profile, with protrusive lips relative to the esthetic line (E-line) and an acute nasolabial angle. The smile demonstrated protrusion of the maxillary incisors without gingival display

Intraoral examination:
(See figures 2 and 3 opposite)
Intraoral examination revealed relatively well-aligned dentition in both arches, with no significant crowding observed. The dental arches were symmetrical with a rounded form. The maxillary and mandibular dental midlines were coincident.

Bilateral canine and first molar relationships were in a Class I tendency.
However, clinical evaluation demonstrated marked proclination of the incisors in both arches. Notably, the anterior segments—particularly the mandibular incisors—showed root positions in close proximity to the labial cortical plate, which could be appreciated clinically.

In addition, the patient presented with several scattered carious lesions.

No tooth agenesis, supernumerary teeth, or extensive structural breakdown was observed. Overjet and overbite were within normal limits, approximately 2 mm.

3. Radiographic & cephalometric analysis (fig. 4)

3.1 Radiographic findings

Panoramic radiographic analysis revealed the presence of tooth #38, while the remaining third molars were absent. No evidence of tooth germ, supernumerary teeth, or abnormalities in tooth number was observed. The crown and root morphology of the remaining dentition were within normal limits, with no signs of root resorption or periapical pathology. The periodontal ligament spaces and alveolar bone crests were well preserved, with no evidence of localized bone loss.

Fig. 2
Pre-treatment intraoral photographs.

Fig. 3
Intraoral scans before treatment.

The inferior alveolar canal, maxillary sinuses, and associated anatomical structures appeared within normal limits. No cystic lesions, tumors, or osseous abnormalities were detected.

Overall, the panoramic radiograph did not reveal any significant abnormalities.

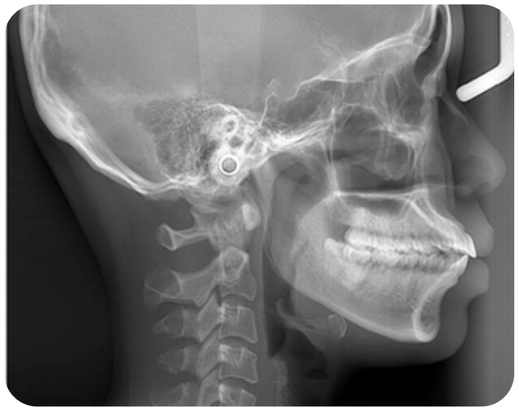
3.2 Cephalometric analysis according to Ricketts

The patient presented with a skeletal Class I relationship, with a convexity of 1.3 mm. Maxillary depth was 91.2°, and facial depth was 89.8°, both within normal limits. The patient exhibited a mesofacial pattern, with a total facial height of 58.7°, indicating an average vertical facial dimension [9].

Regarding the mandible, both its position and growth direction were within normal limits. Specifically, the FMA was 24.3°, facial axis was 87.5°, and facial taper was 66°, all suggesting a normal vertical growth pattern. In addition, the lower facial height was 46.5°, also within normal limits. Overall, the skeletal foundation, mandibular growth direction, and lower facial height showed no significant abnormalities [9].

However, the most prominent discrepancy was observed in the dental component, particularly the protrusion and proclination of the incisors in both arches. The mandibular incisors were markedly protrusive, as indicated by a lower incisor to A-Pog distance of 9.3 mm and an incisor axis to A-Pog angle of 33.5°.

The interincisal angle was significantly reduced to 99.5°, compared to the normal value of approximately 126°, indicating pronounced protrusion and labial inclination of the incisors [9].



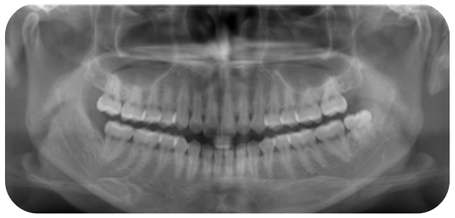
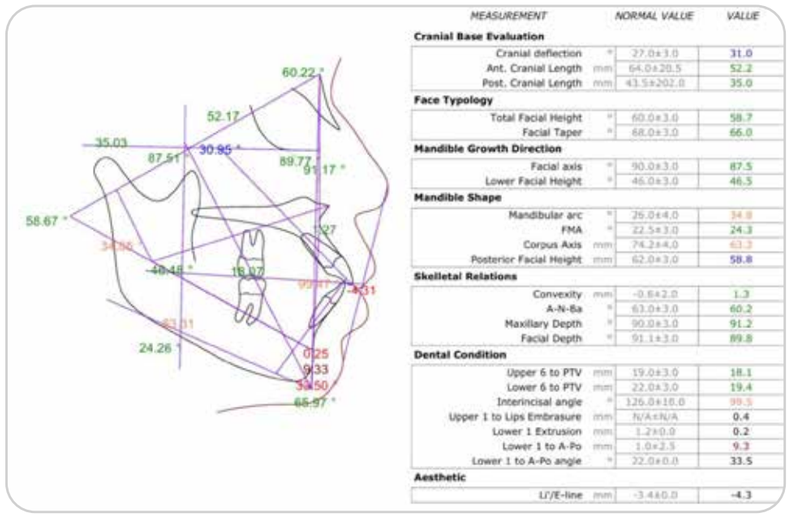


Fig. 4
Pre-treatment radiographs.



MEASUREMENT		NORMAL VALUE	VALUE
Cranial Base Evaluation			
Cranial deflection	°	27.0±3.0	31.0
Ant. Cranial Length	mm	64.0±20.5	52.2
Post. Cranial Length	mm	43.5±202.0	35.0
Face Typology			
Total Facial Height	°	60.0±3.0	58.7
Facial Taper	°	68.0±3.0	66.0
Mandible Growth Direction			
Facial axis	°	90.0±3.0	87.5
Lower Facial Height	°	46.0±3.0	46.5
Mandible Shape			
Mandibular arc	°	26.0±4.0	34.8
FMA	°	22.5±3.0	24.3
Corpus Axis	mm	74.2±4.0	63.2
Posterior Facial Height	mm	62.0±3.0	58.8
Skeletal Relations			
Convexity	mm	-0.8±2.0	1.3
A-N-Ba	°	63.0±3.0	60.2
Maxillary Depth	°	90.0±3.0	91.2
Facial Depth	°	91.1±3.0	89.8
Dental Condition			
Upper 6 to PTV	mm	19.0±3.0	18.1
Lower 6 to PTV	mm	22.0±3.0	19.4
Interincisal angle	°	126.0±16.0	99.5
Upper 1 to Lips Embrasure	mm	N/A±N/A	0.4
Lower 1 Extrusion	mm	1.2±0.0	0.2
Lower 1 to A-Po	mm	1.0±2.5	9.3
Lower 1 to A-Po angle	°	22.0±0.0	33.5
Aesthetic			
Li'/E-line	mm	-3.4±0.0	-4.3

Fig. 5
Pre-treatment Ricketts cephalometric analysis.

Furthermore, lateral cephalometric evaluation revealed a very thin labial alveolar bone in the anterior region of both arches, with the incisor roots positioned in close proximity to the labial cortical plate.

4. Diagnosis

Skeletal diagnosis:
Skeletal Class I relationship with an average vertical growth pattern.
Dental diagnosis:
Class I malocclusion with severe proclination of the maxillary and mandibular incisors. The incisor roots were positioned close to the labial cortical plate. Overjet and overbite were within normal limits (approximately 2 mm). No significant crowding was observed.
Soft tissue diagnosis:
Convex facial profile, with both the upper and lower lips protrusive relative to the esthetic line (E-line) and an acute nasolabial angle. On smiling, the maxillary incisors were prominently protrusive, with no evidence of a gummy smile.

TREATMENT OBJECTIVES

The treatment objectives were as follows:
- to extract the premolars and achieve space closure in order to reduce the protrusion of the maxillary and mandibular incisors;
- to establish a Class I occlusal relationship, with overjet and overbite within normal limits (approximately 2–3 mm), and to achieve coincident maxillary and mandibular dental midlines;
- to improve facial esthetics by reducing lip protrusion and achieving harmony with the esthetic line (E-line);
- to control root movement of the incisors and canines in all three dimensions, thereby facilitating efficient anterior tooth movement during space closure, particularly in the presence of initial root proximity to the labial cortical plate.

TREATMENT PLAN

The following treatment options were considered:
- Distalization of both arches combined with extraction of tooth #38, using miniscrews for skeletal anchorage to facilitate space gain and anterior retraction [10];
- Extraction of four first premolars, followed by space closure using continuous archwire mechanics with sliding mechanics [1,11,12,];
- Extraction of four first premolars, followed by space closure using segmental mechanics based on the Bioprogressive technique, with precise control achieved through bends incorporated into segmental archwires [8,13].

After careful consideration of the treatment options, based on the severity of dentoalveolar protrusion, compromised facial esthetics, and the patient's chief complaint, extraction of the four first premolars was selected, and informed consent was obtained from the patient.
Given the close proximity of the maxillary and mandibular incisor roots to the labial cortical plate, root control during tooth movement was expected to be more challenging. Therefore, the segmental approach based on the Bioprogressive technique (option 3) was chosen to achieve better three-dimensional control of tooth movement.

TREATMENT PROGRESS

1. Alignment & leveling

0.018-inch MBT prescription brackets were bonded. Occlusal bite blocks were placed on the mandibular first and second molars using glass ionomer cement to prevent occlusal interference with the brackets during the initial phase of treatment.

A 0.014-inch nickel–titanium (NiTi) archwire was placed for one month to achieve initial alignment and to allow the patient to adapt to the orthodontic forces. This was followed by a 0.016-inch NiTi archwire. Subsequently, the four first premolars were extracted in two stages: teeth #14 and #44 were extracted first, followed by extraction of teeth #24 and #34 two weeks later.

Two miniscrews (1.6 × 8 mm) were inserted in the maxillary interradicular region between the second premolar and first molar (5–6 region) to reinforce anchorage. This was particularly important in the maxilla due to its relatively lower bone density and higher susceptibility to anchorage loss compared with the mandible.

A 0.016 × 0.022-inch NiTi archwire was placed after one month.
Ligature ties were applied from the miniscrews to the maxillary second premolars (teeth #5) to reinforce posterior anchorage. Additional ligatures were placed from the miniscrews to the maxillary canines (teeth #3) to further enhance anchorage control.

In the mandibular arch, lacebacks were applied from the posterior teeth to the canines using stainless steel ligature wires.
After completion of the alignment and leveling phase, treatment was progressed to segmental space closure mechanics.

2. Canine retraction and incisor retraction using segmented mechanics

Segmental three-piece retraction loops were utilized during this phase. The loops were fabricated from 0.016 × 0.022-inch titanium–molybdenum alloy (TMA) wire.
In this case, three types of segmental retraction loops were employed at different stages, including T-loops, mouse loops, and delta box loops. In addition, a box loop was used specifically for the control of undesirable side effects; this loop did not serve a retraction function.
In the initial stage, mouse loops were applied in segments I, II, and III, while a T-loop was used in segment IV.

At these loops, six control activations were incorporated as follows:
– positive torque of 20° on the canines;
– 30° toe-in on the canines;
– 30° toe-in on the first molars;
– 1 mm of intrusion on the canines;
– 30° tip-back on the canines;
– 30° tip-back on the first molars.

These control activations were designed to counteract the undesirable side effects generated by space closure mechanics performed below the center of resistance of the teeth.

The loops were activated at a rate of approximately 1.5 mm per month to achieve distalization of the canines. Monthly appointments were required to remove the loops for evaluation of deformation due to material fatigue, as well as to assess tooth movement, allowing for reactivation and adjustment of the control parameters as needed.

A utility arch was placed in the mandibular arch, with a tip-back bend incorporated near the molar region on the horizontal segment. This was intended to intrude the incisors, upright the molars distally, and reinforce mandibular anchorage.

During canine retraction, the roots of the canines remained in close proximity to the labial cortical plate, which interfered with tooth movement. This indicated that the control forces generated by the retraction loops were insufficient to counteract the negative torque effect produced during retraction, in combination with the unfavorable initial root position. Therefore, box loops with 30° of positive torque activation were introduced. In addition, utility arches in both arches were used to apply a compressive force against the body of the box loops, thereby enhancing the positive torque effect. This biomechanical approach will be discussed in detail in the Discussion section.

Fig. 6
Extraction of first premolars and initial leveling with continuous archwire.

Fig. 7
Segmental canine retraction using loop mechanics.

After three months of torque correction of the canines, the retraction loops were reinserted. A delta box loop was used in the maxillary arch, while a T-loop was applied in the mandibular arch.
Due to the increased length of the delta box loop, the bracket on the maxillary second premolar (tooth #5) was temporarily removed to accommodate the loop design.

After completion of canine retraction, a Class I canine relationship was achieved. Subsequently, en-masse retraction of the four maxillary and mandibular incisors was initiated using Ricketts retraction arches in both arches. These retraction arches were fabricated from 0.016 × 0.022-inch TMA wire.

The applied activations included intrusion, positive torque, and anterior retraction at a rate of approximately 1.5 mm per month. Maxillary miniscrew anchorage was removed at this stage.

During the retraction phase, the mandibular incisor roots were in close proximity to the labial cortical plate. Therefore, a positive torque activation of 20° was incorporated into the anterior vertical segment of the mandibular retraction arch using omega pliers.

A new maxillary retraction arch was fabricated using 0.018 × 0.022-inch TMA wire. The force system generated by the retraction arch produced intrusion of the four maxillary incisors while simultaneously retracting them. As a result, a vertical discrepancy developed between the canines and the maxillary incisors.

A box loop was therefore incorporated at the maxillary canines to achieve intrusion of these teeth, thereby harmonizing the occlusal plane of the maxillary arch.

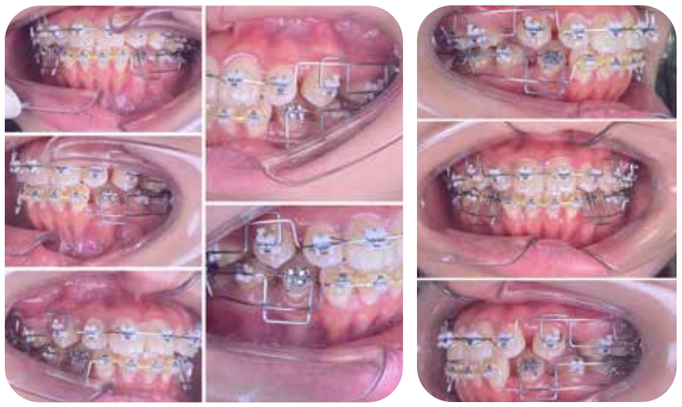


Fig. 8
Box loop combined with utility arch (UA) for torque control of the canine.

3. Final alignment, leveling, and torque control of the mandibular dentition using an ART archwire

After completion of space closure of the four incisors, a 0.016-inch NiTi archwire was reinserted, and full-arch ligation was performed using stainless steel ligatures. This was followed by a 0.016 × 0.022-inch NiTi archwire, with light power chains applied across both arches.

A utility arch was placed in the maxillary arch and activated for intrusion to control the maxillary occlusal plane and prevent extrusion of the maxillary incisors, which commonly occurs during re-leveling after retraction with retraction arches.

Intermaxillary elastics (3/16-inch, 3.5 oz) were worn full-time (24 hours per day) for three months to improve intercuspation.
An ART archwire was used in the mandibular arch for an additional three months to further enhance positive torque of the mandibular incisors, applied within a continuous archwire system.The appliances were removed, and treatment was completed. The total treatment duration was 30 months.

Retention was achieved using Hawley retainers in both arches.
The patient was instructed to wear the retainers full-time (24 hours per day), except during meals and oral hygiene, for the first year, followed by nighttime wear thereafter [16].
Post-treatment cephalometric analysis according to the Ricketts system demonstrated a marked improvement in the inclination and protrusion of the incisors. The mandibular incisors showed a reduction in inclination from 33.5° to 18.6°, while the degree of protrusion (L1–A-Pog) decreased from 9.3 mm to 3.4 mm.

The interincisal angle increased from 99.5° to 138°, with all dental parameters returning to normal physiological ranges.
Skeletal measurements showed no significant changes, and a skeletal Class I relationship was maintained. [9]

Superimposition of pre- and post-treatment tracings revealed posterior repositioning and improved axial inclination of the incisors in both arches. The posterior teeth demonstrated slight mesial movement, consistent with the moderate anchorage strategy employed.

Notably, in the mandibular arch, although the incisor roots remained in close proximity to the labial cortical plate after treatment, no displacement beyond the cortical boundary was observed. The root position was maintained without deterioration, despite the substantial amount of tooth movement achieved during space closure.

Mild apical root resorption was observed in the incisor region.

Fig. 9
Canine retraction using loop mechanics and anterior retraction using retraction arch.

Fig. 10
Positive torque activation on the retraction arch and intrusion of the canine using a box loop.

TREATMENT RESULTS

Post-treatment results demonstrated the establishment of a functional and stable occlusion. A Class I relationship was achieved for both canines and first molars bilaterally, with well-defined cusp–fossa interdigitation. Sagittal and vertical relationships were maintained within physiological limits, as evidenced by overjet and overbite of approximately 2 mm.

In addition, coincident maxillary and mandibular midlines, together with well-aligned dentition, contributed to balanced and harmonious dental arches in both arches.

Soft tissue changes played a significant role in the overall outcome. The facial profile became more balanced compared with the pretreatment condition, with the lips repositioned posteriorly toward the esthetic E-line. Mentalis strain was reduced, resulting in a softer facial appearance and improved overall facial esthetics. Subjective evaluation from the patient also indicated a high level of satisfaction following treatment.

The root position was well controlled, with no evidence of apical displacement beyond the labial cortical plate. Mild root resorption was observed and considered clinically acceptable. (fig. 17 et 18).

DISCUSSION

1. Extraction decision for premolars:

In this clinical case, extraction of the four first premolars was indicated to achieve optimal reduction of dentoalveolar protrusion. The patient presented with a skeletal Class I relationship (convexity < 2 mm), indicating that the discrepancy was primarily dentoalveolar in origin, characterized by excessive proclination and protrusion of both maxillary and mandibular incisors. Therefore, treatment objectives were focused on controlling and retracting the incisor position.

Two treatment options were considered:
- distalization of the entire dentition using space from third molar extraction;
- extraction of premolars to create space for anterior retraction, with or without arch expansion.

However, in this patient, the degree of incisor protrusion and lip prominence was severe, with a convex facial profile. The mandibular incisor protrusion (L1–A-Pog) was 9.3 mm, significantly exceeding the normal range (1 ± 2.5 mm) as described in *Contemporary Orthodontics* by Proffit *et al.* [2]. The required amount of incisor retraction was estimated to be approximately 6 mm, whereas distalization in the mandibular arch is generally limited to approximately 2–3 mm.

Fig. 11
Finishing with continuous archwire, intermaxillary elastics for occlusal settling, and utility arch for maxillary intrusion

Fig. 12
Post-treatment intraoral photographs.

Fig. 13
Post-treatment extraoral photographs.

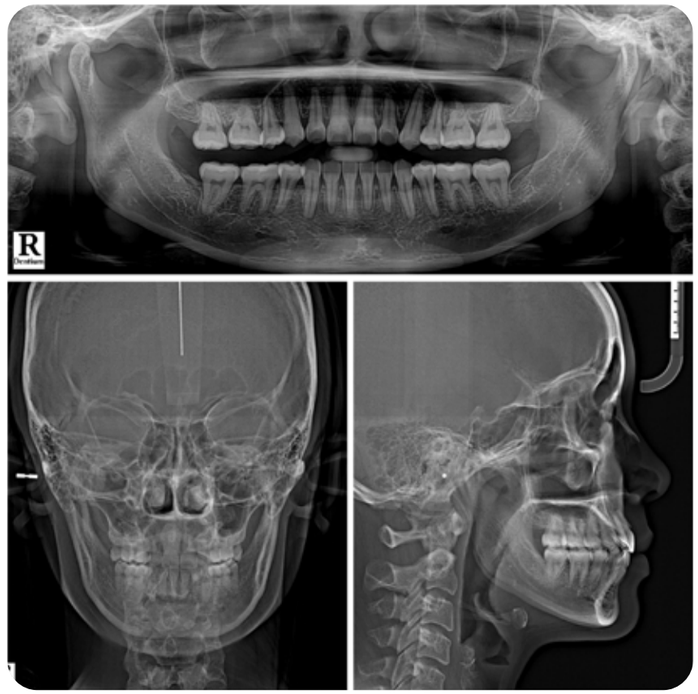
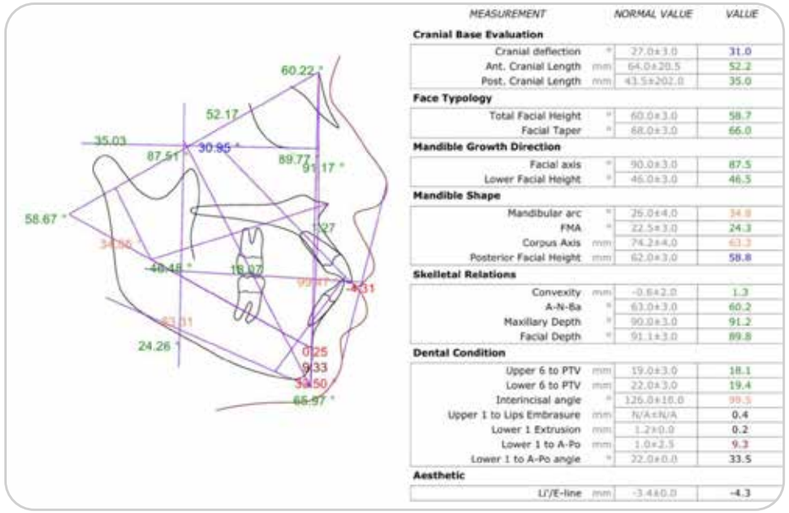


Fig. 14
Post-treatment lateral cephalometric and panoramic radiographs.



MEASUREMENT		NORMAL VALUE	VALUE
Cranial Base Evaluation			
Cranial deflection	°	27.0±3.0	31.0
Ant. Cranial Length	mm	64.0±20.5	52.2
Post. Cranial Length	mm	43.5±202.0	35.0
Face Typology			
Total Facial Height	°	60.0±3.0	58.7
Facial Taper	°	68.0±3.0	66.0
Mandible Growth Direction			
Facial axis	°	90.0±3.0	87.5
Lower Facial Height	°	46.0±3.0	46.5
Mandible Shape			
Mandibular arc	°	26.0±4.0	34.8
FMA	°	22.5±3.0	24.3
Corpus Axis	mm	74.2±4.0	63.3
Posterior Facial Height	mm	62.0±3.0	58.8
Skeletal Relations			
Convexity	mm	-0.6±2.0	1.3
A-N-Ba	°	63.0±3.0	60.2
Maxillary Depth	°	90.0±3.0	91.2
Facial Depth	°	91.1±3.0	89.8
Dental Condition			
Upper 6 to PTV	mm	19.0±3.0	18.1
Lower 6 to PTV	mm	22.0±3.0	19.4
Interincisal angle	°	126.0±16.0	99.5
Upper 1 to Lips Embrasure	mm	N/A±N/A	0.4
Lower 1 Extrusion	mm	1.2±0.0	0.2
Lower 1 to A-Po	mm	1.0±2.5	9.3
Lower 1 to A-Po angle	°	22.0±0.0	33.5
Aesthetic			
LI'/E-line	mm	-3.4±0.0	-4.3

Fig. 15
Post-treatment Ricketts cephalometric analysis.

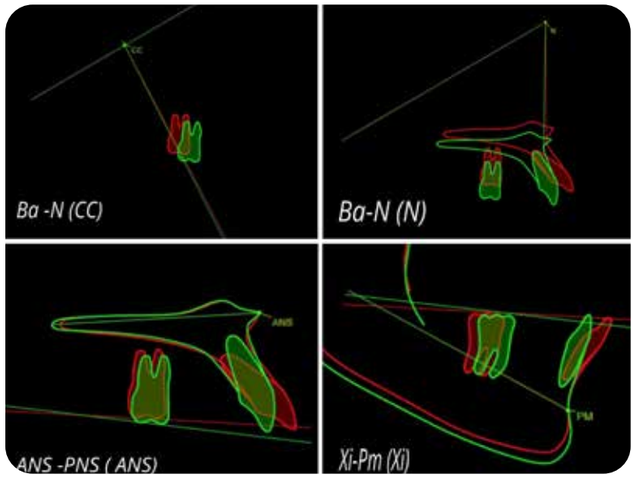


Fig. 16
Superimposition between Pre and Post – Treatment.

Therefore, non-extraction treatment would be insufficient to achieve both esthetic and biomechanical objectives, as supported by extraction guidelines and clinical studies on bimaxillary protrusion [11,12].
In addition, the dental arches were well developed, and arch expansion was not expected to provide a significant increase in available space.

Therefore, extraction of four first premolars, providing approximately 7–8 mm of space per side, allowed sufficient room for anterior retraction, improvement of incisor inclination, reduction of lip protrusion, and optimization of facial esthetics, consistent with previous reports on the treatment of bimaxillary protrusion and associated soft tissue changes [1,5,12].

Regarding third molars, their role in late mandibular crowding remains controversial, as discussed by Proffit et al. [2]; however, removal may be considered to facilitate treatment mechanics in selected cases. In this case, the third molar was therefore extracted.

2. Discussion of the advantages of segmental mechanics based on the Bioprogressive technique compared with continuous archwire sliding mechanics

When tooth movement is performed using a continuous archwire, if the force vector is not designed to pass through the center of resistance of the dental arch, and the force is applied inferiorly (toward the occlusal plane) relative to

Fig. 17
Comparison between pre- and post-treatment.

Fig. 18
Comparison of incisor root position before and after treatment.

the center of resistance, multiple undesirable side effects may occur.
Sliding mechanics on a continuous straight archwire generate rotational moments that tend to rotate the maxillary arch clockwise and the mandibular arch counterclockwise.

This force system results in extrusion and lingual inclination (negative torque) of the incisors in both arches. The canines are particularly affected, exhibiting undesirable effects such as negative torque, intrusion, distal crown tipping with limited root movement, and rotational tendencies. In addition, the posterior teeth tend to tip mesially into the extraction spaces.

As a consequence, anterior overbite may increase, gingival display may become more pronounced, and posterior open bite may develop.

These undesirable effects contribute to a "rolling effect" that interferes with efficient tooth movement, particularly by deepening the anterior bite [15,16].

In addition, increased friction at the bracket–archwire interface reduces the efficiency of tooth movement, slows the rate of tooth displacement, and requires greater force to achieve distalization [17].

This increase in force magnitude results in a proportional increase in rotational moments, thereby exacerbating the undesirable side effects (moment equation: M = F × d) [15].

Segmental space closure mechanics, as described by Ricketts [8,13] , are based on the Bioprogressive technique and involve the use of specific biomechanical components, including:

- three-piece retraction loops for canine movement (e.g., T-loop, Las Vegas loop, delta box loop, mouse loop);
- utility arches for controlling incisor intrusion and position;
- retraction arches for en-masse incisor retraction in both arches

> Bioprogressive segmental mechanics represent a frictionless system of tooth movement. In this approach, loops and archwires are designed with multiple control activations, including tip, positive torque, toe-in, and intrusion. These activations play a critical role in neutralizing undesirable side effects that arise when the line of action of force does not pass through the center of resistance of the teeth [8,13,15].

> All control bends are incorporated directly into the archwire and can be adjusted or reactivated periodically according to clinical progress. This allows precise control of tooth movement, facilitating translation and minimizing unwanted tipping or rotational effects. In addition, these loop systems can generate relatively low and continuous forces, which are considered more biologically favorable for periodontal tissues, particularly when fabricated from high-elasticity alloys such as titanium–molybdenum alloy (TMA) [15].

However, this technique is highly technique-sensitive and requires advanced wire-bending skills from the clinician. Furthermore, the complexity of the appliance system may lead to patient discomfort and can present challenges in maintaining oral hygiene during treatment.

3. Control of tooth movement using activations incorporated into segmental archwire systems

a. Control mechanics applied in canine retraction loops

When force is applied below the center of resistance during canine retraction, a series of undesirable effects may occur due to the generated rotational moments. These include lingual inclination (negative torque), uncontrolled tipping of the crown, delayed root movement relative to the crown, distal rotation of the canine, and extrusion [15].

In the present case, the canines were initially positioned with their roots in close proximity to the labial cortical plate, indicating a pre-existing tendency toward negative torque.
Therefore, the retraction loops were designed to incorporate specific control activations

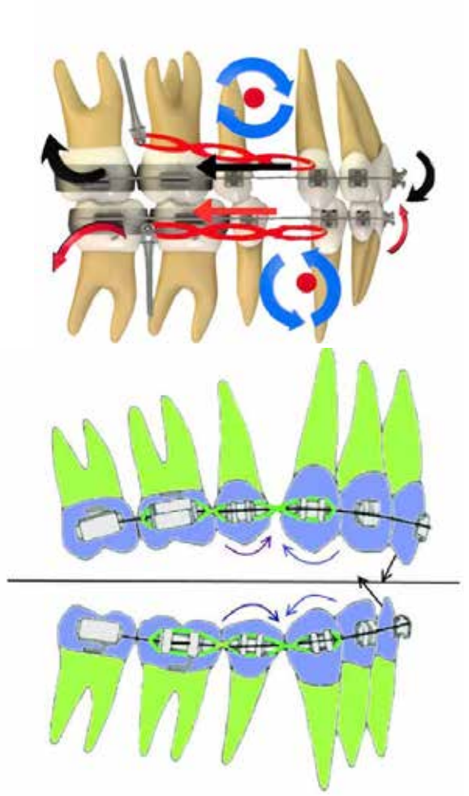


Fig. 19
Rotational moments causing undesirable effects during tooth movement and illustration of the rolling effect

to counteract these effects, with particular emphasis on positive torque control.
The following activations were incorporated into the loop system: **20° of positive torque, 1 mm of intrusion at the canine, 30° of toe-in, and 30° of tip-back applied to both the canine and first molar segments,** as illustrated in the following figure [13].

These control bends allowed for improved regulation of the moment-to-force ratio, facilitating more controlled tooth movement and minimizing undesirable side effects [15].

The loops used in this phase included T-loops, mouse loops, and delta box loops, fabricated from 0.016 × 0.022-inch TMA or BE wire. In particular, mouse loops and delta box loops incorporate helices that enhance springiness and provide more controlled and elastic force delivery. These loop systems generated relatively light forces for canine retraction, approximately 60–80 g with an activation of 1.5–2 mm per month. This force magnitude is within the range of physiologic tooth movement, thereby minimizing the risk of alveolar bone loss and apical root resorption [8,13].

The mouse loop can even be fabricated using 0.017 × 0.025-inch TMA wire for use with a 0.022-inch bracket slot. It incorporates two helical loops, which enhance elasticity and allow the delivery of light, continuous, and biologically favorable forces to the dentition [18].

b. Control mechanics using box loops and utility arch (UA)

During canine retraction, difficulties were encountered at certain stages in achieving adequate positive torque control, primarily due to the close proximity of the canine roots to the labial cortical plate. Therefore, space closure was temporarily suspended, and a box loop with approximately 30° of built-in positive torque was applied to the canine. The loop was fabricated using 0.016 × 0.022-inch blue elgiloy (BE) wire.

Upon insertion, the body of the box loop was observed to incline buccally, indicating the presence of significant positive torque activation, as illustrated in the corresponding figure.

Subsequently, a utility arch (UA) was placed extending from the first molars to the incisor segment. The horizontal segment of the UA was positioned in contact with the body of the box loop, generating a compressive force that further activated and reinforced the positive torque expression on the canine. This biomechanical interaction facilitated the movement of the root toward the cancellous bone.

This technique, which combines a torque-activated box loop with a utility arch applying pressure onto the loop body, proved effective in enhancing positive torque control of the canine.
After approximately three months, once the root had been repositioned more favorably within the alveolar bone, canine retraction was resumed using controlled segmental loop mechanics as previously described.

c. Control mechanics using retraction arches for anterior teeth

The anterior segment was retracted using segmental mechanics based on the Bioprogressive philosophy described by Ricketts. Retraction arches in both the maxillary and mandibular arches were designed to simultaneously achieve three key objectives:

- controlled retraction of the incisors, delivered by a frictionless system using resilient 0.016 × 0.022-inch TMA wire with loop configurations that allow light and continuous forces;
- incorporation of an intrusive force component to counteract anterior extrusion during space closure;
- generation of stable and sufficient positive torque to ensure proper root control in three dimensions, particularly in the mandibular incisors, achieved through torque activation on the anterior vertical segment of the retraction arch [8,13,15].

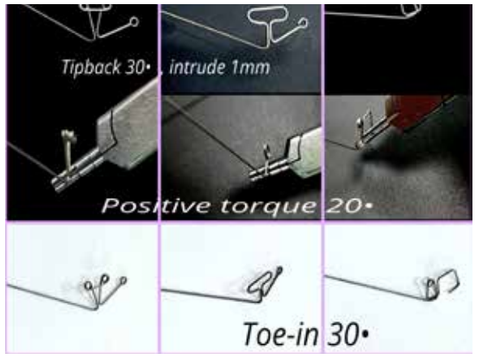


Fig. 20
Control activations incorporated into the canine retraction loop.

The retraction arches were activated at a rate of approximately 1.5 mm per month, while maintaining control of both torque and vertical dimension. This type of retraction system can be considered a biologically favorable approach, as it provides controlled force systems with appropriate moments for intrusion and torque, thereby preventing deepening of the bite and loss of incisor torque during space closure [15].

- From a biological control perspective, despite the prolonged space closure phase, the mandibular incisor roots were maintained within the safe limits of the alveolar bone. No evidence of labial cortical plate perforation was observed, nor were there any significant adverse changes in torque. This outcome is particularly noteworthy given the initial proximity of the roots to the labial cortical plate, which is known to increase the risk of complications during orthodontic tooth movement.

- Mild apical root resorption was observed in the incisor region. According to Levander and Malmgren, root resorption of less than 2 mm is classified as Grade 2. Mild root resorption is commonly observed and is generally considered clinically insignificant in orthodontic treatment [19,20].

CONCLUSION

Segmental space closure using the Bioprogressive technique demonstrated high effectiveness in the treatment of bimaxillary incisor protrusion in an adult patient with incisors positioned close to the labial cortical plate. The use of Bioprogressive mechanics, including segmental loops for canine retraction combined with controlled anterior retraction arches, allowed precise three-dimensional control of tooth movement throughout treatment. This approach enhanced force efficiency, reduced friction, and contributed to a shorter treatment duration.

Favorable incisor inclination was achieved, with a significant reduction in dental protrusion and improvement in facial esthetics. Importantly, root position was maintained within the alveolar housing despite the initial proximity to the labial cortical plate.

Clinical insight

In cases where roots are positioned close to the cortical plate, conventional sliding mechanics may increase the risk of torque loss and iatrogenic complications such as root resorption or cortical plate perforation. In contrast, segmental Bioprogressive mechanics, with built-in control of torque, intrusion, and moment-to-force ratio, allow clinicians to actively manage these risks and guide tooth movement toward controlled translation, while minimizing friction and reducing treatment time.

Fig. 21
Illustration of positive torque control of the canine using a box loop.
(1) Design of the box loop fabricated from 0.016 × 0.022-inch blue elgiloy wire
(2) Application of 30° positive torque on the box loop
(3) Insertion of the box loop into the arch
(4) Buccal inclination of the box loop body
(5) Utility arch (UA) contacting the body of the box loop
(6) Gingival displacement of the loop body by the UA, enhancing positive torque expression on the canine.

Clinical significance

This technique provides a predictable, biologically sound, and safe approach for managing complex cases requiring substantial anterior retraction within anatomical limitations, particularly when roots are positioned close to the labial cortical plate, while also optimizing treatment efficiency and long-term stability.

DECLARATIONS

Ethical approval

The study was conducted in accordance with ethical standards.
Ethical approval was not required as this was a case report, no experimental procedures were performed, and no ethical issues were involved.

The patient granted permission for the use and publication of clinical data and images..

Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' contributions

Dao Quang Huy is the sole author of this manuscript. The author was responsible for the conception and design of the study, acquisition, analysis, and interpretation of the clinical data, drafting and critical revision of the manuscript, and final approval of the version to be published.

Conflict of interest

The author declares no conflict of interest.

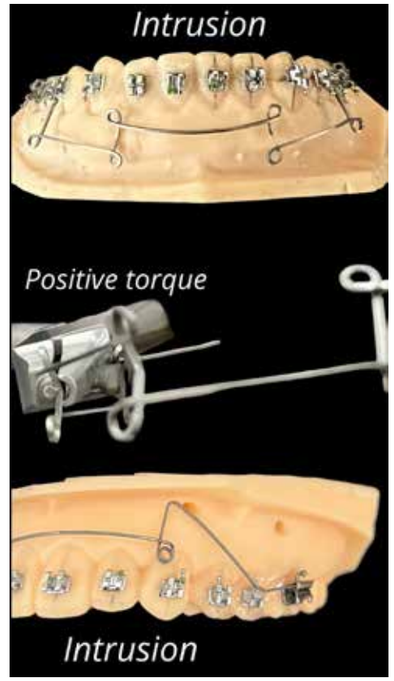


Fig. 22
Intrusive and positive torque activations on the anterior retraction arch.

BIBLIOGRAPHY

1. Bills, D. A., Handelman, C. S., & BeGole, E. A. (2005). Bimaxillary dentoalveolar protrusion: traits and orthodontic correction. *The Angle Orthodontist, 75*(3), 333-339.

2. Proffit, W. R. *et al.* (2019). *Contemporary Orthodontics, 6e : South Asia Edition-E-Book*. Elsevier Health Sciences.

3. Ricketts, R. M. (1968). Esthetics, environment, and the law of lip relation. *American journal of orthodontics, 54*(4), 272-289.

4. Burstone, C. J. (1967). Lip posture and its significance in treatment planning. *American journal of orthodontics, 53*(4), 262-284.

5. Leonardi, R. *et al.* (2010). Soft tissue changes following the extraction of premolars in nongrowing patients with bimaxillary protrusion. *The Angle Orthodontist, 80*(1), 211-216.

6. Handelman, C. S. (1996). The anterior alveolus: its importance in limiting orthodontic treatment and its influence on the occurrence of iatrogenic sequelae. *The Angle Orthodontist, 66*(2), 95-110.

7. Horiuchi, A., Hotokezaka, H., & Kobayashi, K. (1998). Correlation between cortical plate proximity and apical root resorption. *American Journal of Orthodontics and Dentofacial Orthopedics, 114*(3), 311-318.

8. Ricketts, R. M. (1976). Bioprogressive therapy as an answer to orthodontic needs part I. *American journal of orthodontics, 70*(3), 241-268.

9. Ricketts, R. M. (1960). A foundation for cephalometric communication. *American journal of orthodontics, 46*(5), 330-357.

10. Rosa, W. G. N. *et al.* (2023). Total arch maxillary distalization using infrazygomatic crest miniscrews in the treatment of Class II malocclusion: a prospective study. *The Angle Orthodontist, 93*(1), 41-48.

11. Araújo, T. M. D., & Caldas, L. D. (2019). Tooth extractions in Orthodontics: first or second premolars? *Dental press journal of orthodontics, 24*, 88-98.

12. Upadhyay M, *et al.* (2010). Treatment effects of mini-implants for en-masse retraction of anterior teeth in bimaxillary protrusion patients. *The Angle Orthodontist, 80*(4):656–663.

13. Ricketts, R. M. (1998). The Widsom of Sectional Mechanics. *American Institute for Bioprogressive Education: Scottsdale, AZ, USA*.

14. Littlewood, S. J., Kandasamy, S., & Huang, G. (2017). Retention and relapse in clinical practice. *Australian dental journal, 62*, 51-57.

15. Burstone C. J. (1962). The biomechanics of tooth movement. In: Kraus B. S., Riedel R. A., editors. *Vistas in Orthodontics*. Philadelphia: Lea & Febiger. 197-213.

16. Almeida, M. R. (2019). Biomechanics of extra-alveolar mini-implants. *Dental press journal of orthodontics, 24*, 93-109.

17. Yanase, Y. *et al.* (2014). Effects of sliding velocity on friction: an in vitro study at extremely low sliding velocity approximating orthodontic tooth movement. *The Angle Orthodontist, 84*(3), 451-458.

18. Kadam, V., Aphale, H., & Nagmode, S. K. (2021). 'Mouse'loop–for frictionless mechanics. *IP Indian Journal of Orthodontics and Dentofacial Research, 7*(2), 171-173.

19. Levander, E., & Malmgren, O. (1988). Evaluation of the risk of root resorption during orthodontic treatment: a study of upper incisors. *The European Journal of Orthodontics, 10*(1), 30-38.

20. Brezniak, N., & Wasserstein, A. (1993). Root resorption after orthodontic treatment: Part 1. Literature review. *American Journal of Orthodontics and Dentofacial Orthopedics, 103*(1), 62-66.

Interceptive treatment:
illusion or reality?

Dr Firas **Haj Ibrahim**

SQODF
Dubaï (United Arab Emirates)

hajibrahimfiras@gmail.com

Grace is a 9-years-old girl from the Netherlands. She presented for a second orthodontic opinion. Her mother's request was to find an orthodontist who could begin treatment for her daughter as early as possible. The previously consulted colleague had confirmed that orthodontic therapy was not indicated before the completion of the permanent dentition (around age 12) (fig. 1).

EXTRAORAL EXAMINATION (fig. 2)

Grace's face shows a slight chin deviation to the right side, with no notable aesthetic or frontal facial asymmetry.
The profile is transfrontal, associated with mild biprotrusion of the lips and a slightly retrusive mandible with chin muscle contracture.

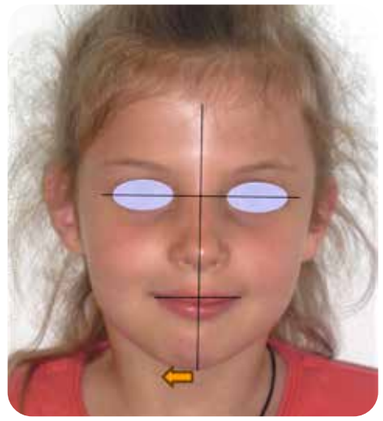
INTRAORAL AND FUNCTIONAL EXAMINATION (fig. 3)

Grace presents with significant respiratory difficulties. She has a history of recurrent otitis media and frequently consulted an ENT specialist for tonsillar infections.

Her tongue posture intermediate, and she exhibits an atypical anterior swallowing pattern. The tongue's volume, mobility, and tonicity are within normal limits.
The molar and canine relationship is Class II on the right side, with a lateral crossbite on the same side. On the left side, the molar and canine relationship is Class I tending toward Class III. The dental arches are constricted, with a V-shaped maxilla and mandibular midline deviation toward the right.

Temporomandibular joint (TMJ) examination reveals no limitation in lateral movements bilaterally.

Fig. 1



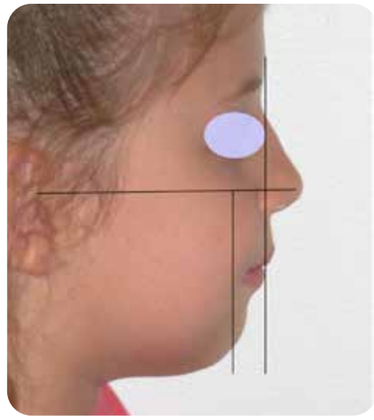


Fig. 2
Frontal and profile photographs.

The mandibular opening range is normal, without joint discomfort or deviation during opening. Grace exhibits a functional mandibular deviation at the end of closure into maximum intercuspation.
Attached gingiva quality is good, and oral hygiene is satisfactory.

DENTAL DESCRIPTION (fig. 3 to 5)

The molar and canine relationship is Class II on the right side with a lateral crossbite on the same side. On the left side, the molar and canine relationship is Class I tending toward Class III.

A right lateral crossbite is present, associated with mandibular midline deviation toward the same side.

The arch form is narrow, with rotation issues of the maxillary molars.

The dento-maxillary discrepancy (DMD) is −4 mm.
No dental caries is present (figs. 4 and 5).

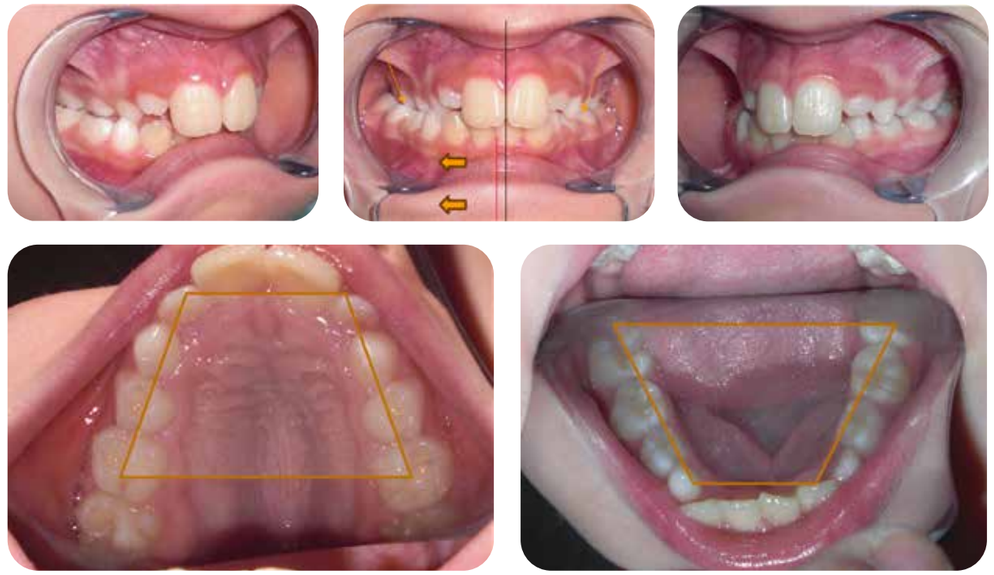
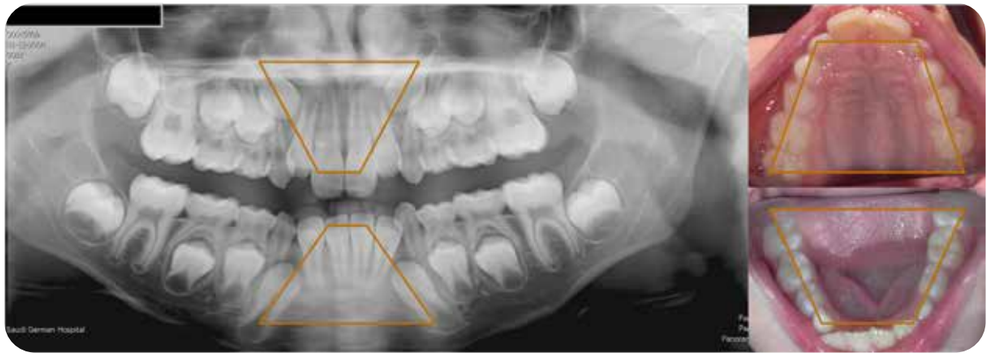


Fig. 3
Intraoral photographs.



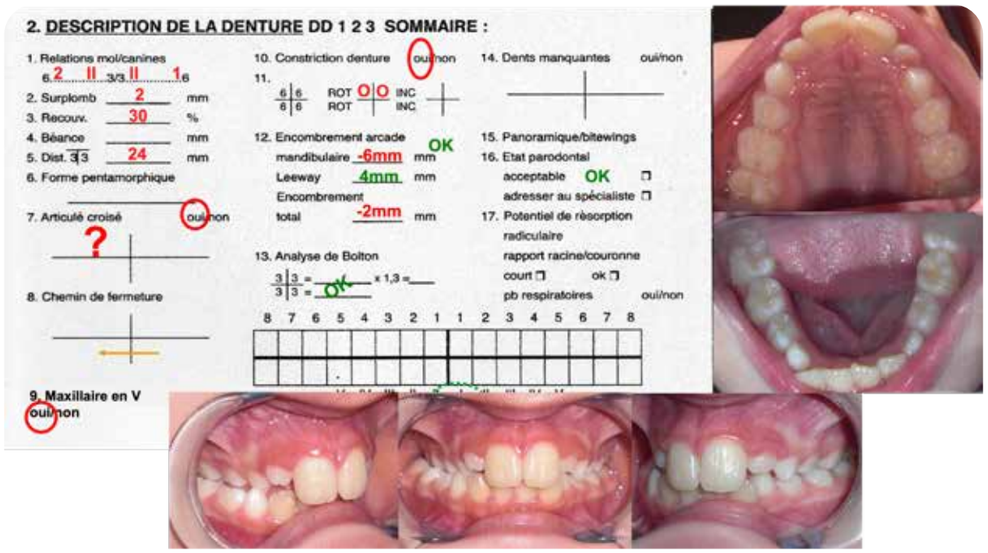


Fig. 4 and 5
Dental description Grace 06/02/2013.

SKELETAL DESCRIPTION

The eyeball (fig. 6)

The eyeball analysis shows hypertrophic adenoids and tonsils, a high position of the hyoid bone, an intermediate posture of the posterior part of the tongue, and a low posture of the anterior part of the tongue.

Cephalometric analysis and summary (fig. 7 et 8)

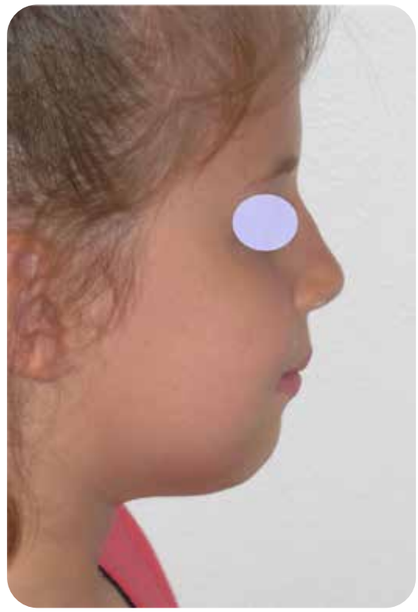
The cranial base is short. Its deflection and morphology favor posterior positioning of the maxilla and anterior positioning of the mandible. Maxillary growth is normal; mandibular growth deficiency is compensated by this anterior projection.

The patient exhibits a dolichofacial pattern. The final intermaxillary relationship is Class I (promaxillary/promandibular). The profile is transfrontal, with biprotrusion of both maxillary and mandibular incisors. (figs. 7 and 8).

Aesthetic Description (fig. 9)

The facial appearance is acceptable, with a transfrontal profile in perfect harmony with the skeletal relationship. The patient exhibits lip biprotrusion. The lower lip is prominent. Lip seal is tight.

The chin is slightly retrusive and deviated to the right, correlating with the lateral crossbite and functional mandibular deviation.



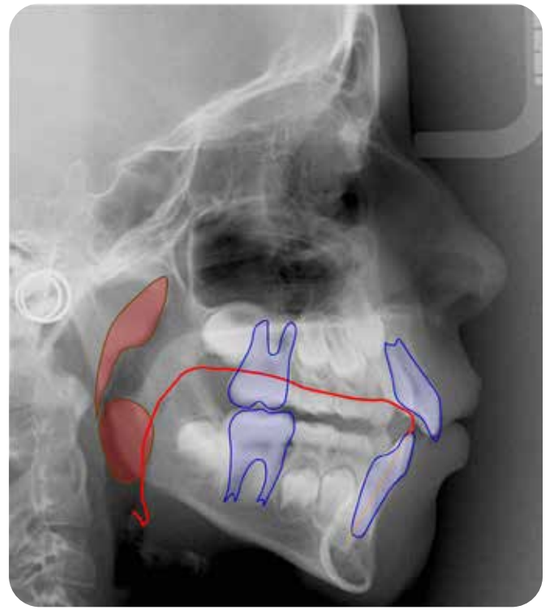


Fig. 6
Eyeball, Grace 02/06/2013.

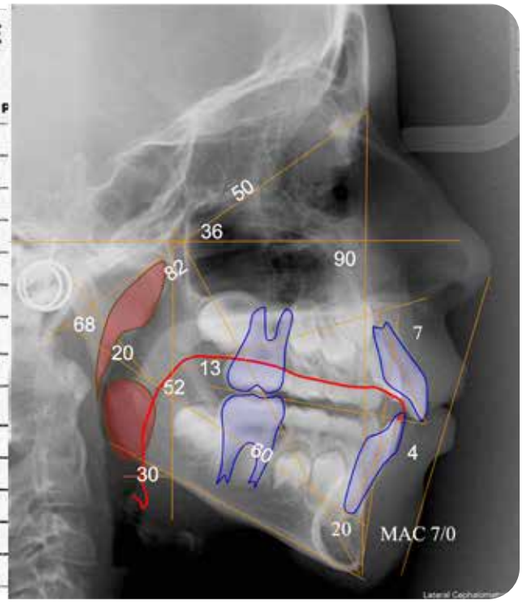


Fig. 7
Skeletal description and cephalometric analysis, Grace 06/02/2013.

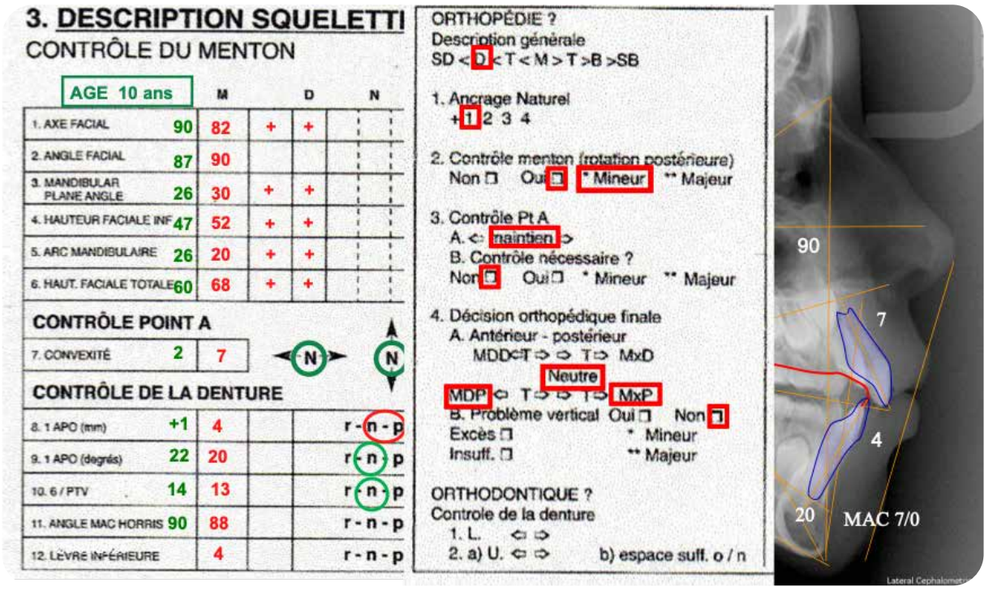


Fig. 8
Skeletal description and cephalometric summary, Grace 06/02/2013.

Fig. 9
Aesthetic description, Grace 06/02/2013.

Functional Matrix (fig. 10)

The breathing is oral; the adenoids and tonsils are hypertrophic. The orbicular muscle is tonic on joint position with chin muscles contracture. Tongue has a medium anterior position. Swallowing function is atypic.

Mandibular posture is disturbed, with functional deviation to the right in occlusion.

Therefore, control of breathing and tongue function is a key element of treatment to ensure effective therapeutic management and stability of results

Treatment Objectives (fig. 11)

After reviewing all diagnostic elements, Grace presents a dental Class I/II relationship with a lateral crossbite and functional mandibular deviation to the right.

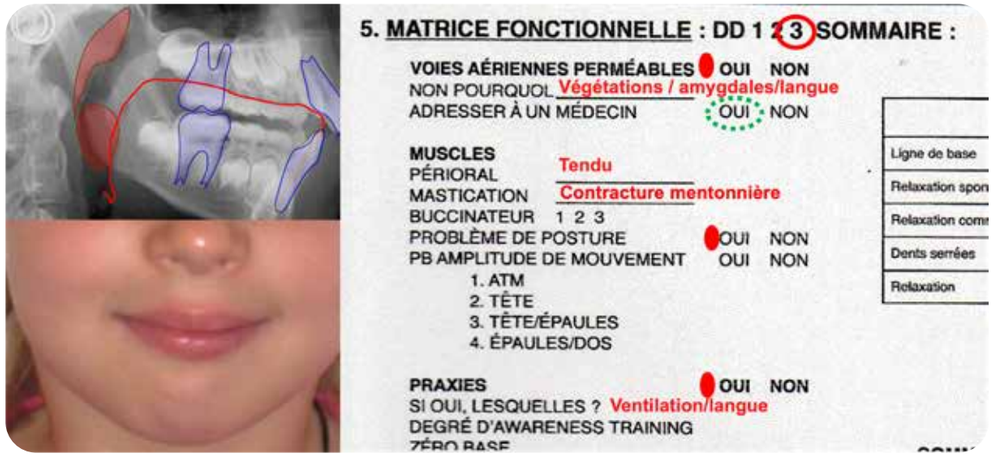


Fig. 10
Functional matrix, Grace 06/02/2013.

Pathological changes in the dental arches are closely linked to disturbances in the respiratory and lingual functional matrix.

Despite cranial base morphology and growth tendencies favoring a skeletal Class III intermaxillary relationship, normal maxillary and mandibular growth combined with the patient's dolichofacial pattern have produced a skeletal Class I relationship with a trans-frontal profile.

The aesthetic profile is in perfect harmony with the skeletal relationship. Treatment is interceptive and functional. It aims to:

- reshape the maxilla;
- correct the lateral crossbite;
- guide incisor development;
- establish proper anterior occlusal determinants;
- Achieve functional harmony with the temporo-mandibular joint.

Treatment success largely depends on respiratory re-education, which is essential to establish correct tongue posture.

The significant volume of tonsils and adenoids may complicate functional re-education. If the patient cannot properly wear her functional appliance, an ENT consultation is mandatory to improve nasal airway patency.

There is considerable controversy regarding the feasibility of functional re-education in patients with lymphoid tissue hypertrophy (adenoids and tonsils). In our opinion, as long as the patient is motivated to perform functional exercises, positive results are achievable. Our clinical experience has demonstrated the efficacy of this approach, with variable outcomes depending on patient motivation and severity of respiratory pathology.

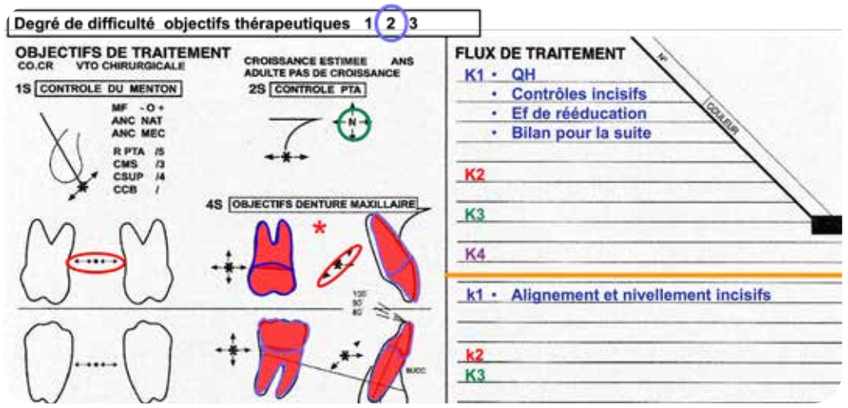


Fig. 11
Treatment objectives and therapeutic's sequences, Grace 06/02/2013

The key question is whether the patient is motivated to perform these functional exercises.

THERAPEUTIC FLOW

1 – Reshaping phase

A Quad-Helix appliance was selected for maxillary reshaping. It was fabricated according to a normal arch form and worn for 9 months.
Bonding of the maxillary incisors was performed at the fourth appointment to level the incisors and establish proper interincisal relationships, facilitating correct canine eruption.
Total duration of the reshaping phase: 10 months.

2 – Respiratory and lingual re-education:

An individual functional appliance was used. Re-education began after completion of maxillary reshaping and incisor leveling. The appliance was worn for several hours daily and attempted during sleep every night.
Although oral breathing complicated appliance use, the patient's motivation was excellent. After 2 months of exercises, Grace was able to wear the appliance all night without losing it.

3 – Progress assessment for permanent dentition phase (figs. 12 to 14)

The maxilla was reshaped. Mandibular reshaping occurred spontaneously.

The lateral crossbite was corrected. Functional mandibular deviation was eliminated. Permanent canines altered their eruption paths and completed eruption on the dental arch without surgical intervention.

4 – Fixed appliance treatment

The braces phase started on 10/29/2015 and ended on 06/12/2017 (17 months). The dental difficulty was minimized by the interceptive and functional treatment. Consequently, treatment was performed with straight wires arches. It involved proper canine positioning, leveling of the dental arches, establishment of an ideal Class I molar and canine relationship, and control of the interincisal relationship (anterior occlusal determinant).

5 – Retention

A fixed bonded retainer was used in the mandibular intercanine area. A removable polycarbonate retention splint was provided for the maxillary arch.
In summary, Grace's treatment was conducted in three phases: (Figs. 15, 16)
- **First phase:** unlocking and interception: 10 months.
- **Second phase:** functional re-education and dental development control: 16 months. During this phase, Grace did not wear fixed appliances. Nasal breathing was established with modification of tongue posture. Grace did not undergo tonsillectomy or adenoidectomy.
- **Third phase:** 17 months with fixed appliances to perfect the occlusion.

Progress assessment for permanent dentition phas (figs. 12 to 14 below):

Fig. 12

Fig. 13

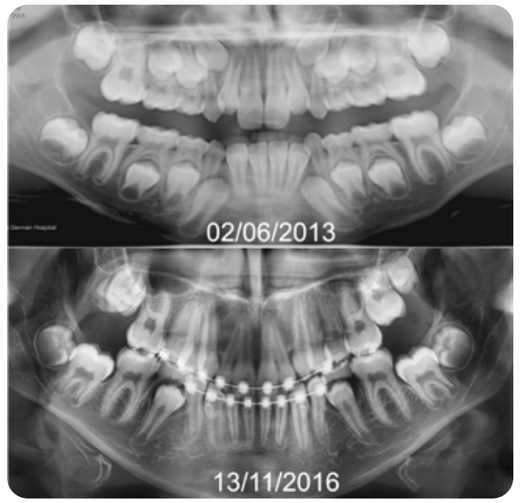


Fig. 14

Administratively, Grace underwent 27 months of active treatment (equivalent to 4–5 semesters in the French system) and 16 months of waiting period (2–3 semesters).

6 – Post-treatment follow-up (fig. 17 et 18)

Grace has maintained her retainers well. Clinical evaluation two years post-treatment (04/24/2019) shows good stability of results.

Radiographic control reveals insufficient space for eruption of the lower third molars (Fig. 18).

7 – Long-Term Stability Control (fig. 19 et 20)

As of 12/23/2023, Grace's orthodontic treatment demonstrates significant stability.

Maxillary retention was discontinued some time ago. The mandibular retainer remains in place without complications (no retainer wire syndrome). The lower left third molar has found space. However, space remains insufficient for teeth 18, 28, and 48.

CONCLUSION

Interceptive treatment is a clinical reality. Timely management of dental, skeletal, articular, and functional problems may provide a medical solution for achieving relative orthodontic stability.

Fig. 15
End-of-treatment photography 10/08/2017.

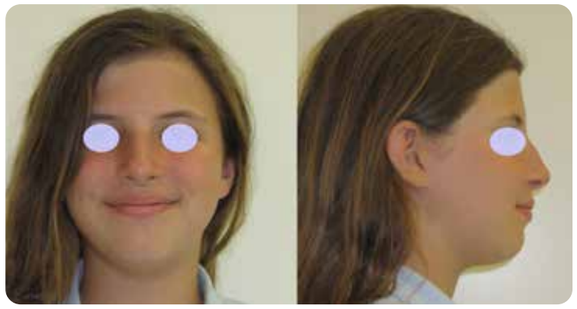


Fig. 16
End-of-treatment photography 10/08/2017.

Fig. 17
Post-treatment dental arch photography (2 years) 04/28/2019.

Fig. 18
Post-treatment radiography (2 years) 04/28/2019.

Fig. 19
Post-treatment dental arch photographs (6 years) 12/23/2023.

Fig. 20
Post-treatment dental arch and facial photography (6 years) 12/23/2023.

Skeletal Class II hyperdivergence in patients with compromised periodontal health: orthosurgical treatment with long-term follow-up

Dr Michel **Lemonnier**
Dr Romy **Moison**
France
contact@docteur-romy-moison.fr

The management of Class II malocclusions in adults with compromised periodontal health presents a major clinical challenge. The simultaneous management of occlusal, aesthetic and periodontal considerations requires a rigorous multidisciplinary approach, incorporating orthodontics, orthognathic surgery, periodontal monitoring and speech therapy.

A 40-year-old female patient presented in early 2018 for orthodontic treatment of mandibular crowding within a complex periodontal context affecting the mandibular incisors. She had previously undergone orthodontic treatment as a teenager, but the crowding had recurred. Periodontal surgery in the lower incisor region had previously been treated with a periodontal graft.

FACIAL EXAMINATION (FIGS. 1 TO 3)

A frontal view of the face reveals an oval-shaped face, generally symmetrical, characterised by muscular hypertonia. The profile is convex, characterised by an open nasolabial angle, associated with chin contracture and eversion of the lower lip.
The labio-mentonier fold appears accentuated. There is also a reduction in the cervico-mentonier distance, linked to excessive vertical length in the lower third of the face.

Fig. 1 to 3
Facial examination.

When smiling, the smile appears wide but tight, revealing an increased incisal overhang, misalignment of the free edges of the incisors, and mandibular crowding.

ORAL EXAMINATION (FIGS. 4 TO 8)

The intraoral examination reveals satisfactory oral hygiene. Numerous restorations are present (carious lesion on tooth 47) and the periodontium appears thin and scalloped, with the presence of a periodontal graft in the mandibular incisor region.

There is vestibular inclination of the maxillary and mandibular incisors, an increased Spee curve, associated with crowding of both arches.

Furthermore, clinical analysis reveals a deficiency in the transverse dimension, with no possibility of expansion on palpation of the lateral sectors.

RADIOLOGICAL EXAMINATION (FIGS. 9 AND 10)

The panoramic radiograph confirms the presence of restorative work on all molars and the need for treatment of tooth 47.

Condylar asymmetry is observed, with posterior wear of the left condylar head without associated symptoms.

Analysis of the panoramic radiographs reveals maxillary endognathia and further confirms the presence of a skeletal Class II malocclusion associated with anterior vertical excess of mixed origin, both maxillary and mandibular, with dento-alveolar compensations.

The anterior teleradiograph was lost during the change of equipment.

Fig. 4 to 8
Intraoral examination.

Fig. 9 to 10
Radiological examination.

FUNCTIONAL EXAMINATION

The functional assessment reveals mixed ventilation as well as atypical swallowing with a low tongue position at rest. Nocturnal bruxism is also reported. The muscular examination reveals hypertonicity of the labio-mentonier belt with labial clenching and contraction of the chin muscle.

This is associated with labial incompetence at rest linked to skeletal vertical excess and vestibular inclination of the maxillary incisors. Mastication is bilateral and alternating with comfort propulsion in order to achieve anterior contact.

All of these functional and muscular imbalances contribute to alveolar bone resorption at the level of the mandibular incisors and contribute to gingival recession as well as the observed periodontolysis.

TREATMENT PLAN

The treatment plan was based on an orthodontic-surgical strategy comprising: a phase of maxillary and mandibular osteogenic distraction; multibracket orthodontic treatment for levelling and aligning the dental arches; orthognathic surgery for maxillary impaction and mandibular advancement combined with genioplasty involving juxta-apical bone grafting and surgery to release the orbiculo-buccinator muscle band; an orthodontic finishing phase using elastic retainers and functional re-education; fixed retention of the Memotain type.

Treatment is envisaged within a multidisciplinary framework, combining rigorous periodontal monitoring and maxillofacial rehabilitation.

TREATMENT (FIG. 11 AND 12)

In April 2018, bands were placed on the first molars (16, 26, 36, 46), in conjunction with a mandibular levelling arch designed to achieve root divergence of the incisors. Disconnectors were placed (not bonded to the maxilla, as requested by the surgeon, but bonded to the mandible), following the placement of separators.

The first surgical phase, performed in May 2018 by Dr Marc Behaghel, involved a Le Fort I maxillary osteotomy combined with a mandibular symphysis osteotomy, allowing for transverse expansion of the bony bases.

Following the procedure, activation was carried out at a rate of three-quarters of a turn per day until an expansion of 5 mm was achieved on each arch. The expanders were stabilised on 14 June 2018.

Radiographic assessments were carried out in early 2019 (Figs. 13–15). Functional rehabilitation was initiated at the same time. A Class I occlusion simulation was performed on models. The preoperative radiographic assessment highlighted the need for treatment on tooth 17.

Posterior occlusal equilibration was performed prior to surgery. Surgical preparation was completed with the placement of metal brackets and ligatures. In April 2019, maxillomandibular surgery (maxillary impaction, mandibular advancement) combined with a reduction genioplasty was again performed by Dr Marc Behaghel.

The orthodontic finishing phase relied on the use of intermaxillary elastics, enabling, in parti-

Fig. 11
Teleradiography.

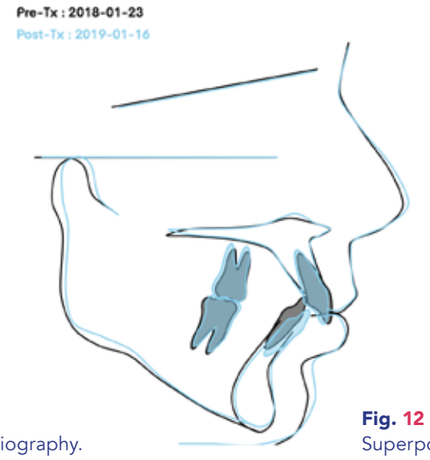


Fig. 12
Superposition.

cular, the correction of residual open bite on the left side. Maxillofacial rehabilitation was initiated to promote posterior occlusion and stimulate the elevator muscles, particularly the masseters. The multi-attachment appliance was removed in November 2019, with some brackets retained for the use of an elastomeric finisher (France Élastodontie). Temporary retainers were fitted pending fabrication (Figs. 16–26).

A recurrence of rotation in the 41 was observed in January 2020, attributed to the use of the vibro-finisher (fig. 27). This was corrected by stripping combined with a short sequence of aligners (three), worn during the day, whilst continuing to wear the elastofinisher at night (figs. 28–32).

At the same time, given the persistence of labio-mentonier tension, the maxillofacial surgeon administered botulinum toxin injections to promote relaxation of the chin area.

Memotain-type fixed retainers were fitted to the maxillary and mandibular arches in June 2020 (figs. 33 and 39). Monitoring of the retainers took place against a specific medical backdrop, characterised by the successive management of two oncological conditions.

Regular follow-up was carried out every six months, then annually. Fitting of transitional splints.
A radiological assessment took place in 2023, on the basis of which a superimposition of images before and after the second maxillomandibular surgery was carried out (figs. 40 and 43). As well as a photographic assessment three years later (figs. 44–51).

Periodontal monitoring is currently underway, and further treatment may be considered following complete oncological remission.

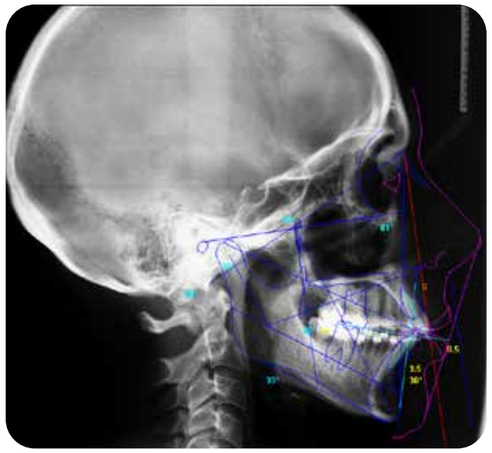


Fig. 13 to 15
Radiological assessment.

Fig. 16 to 25
Installation of temporary gutters.

Fig. 26
Fitting of temporary brackets (continued and concluded).

Fig. 27
Correction of tooth 41 by fitting.

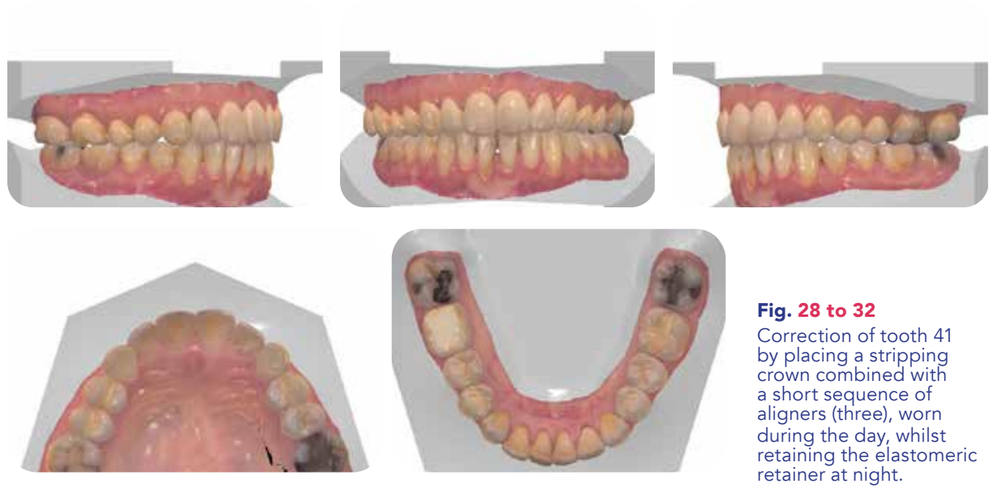


Fig. 28 to 32
Correction of tooth 41 by placing a stripping crown combined with a short sequence of aligners (three), worn during the day, whilst retaining the elastomeric retainer at night.

Fig. 33 to 39
Fitting of Memotain-type fixed retainers.

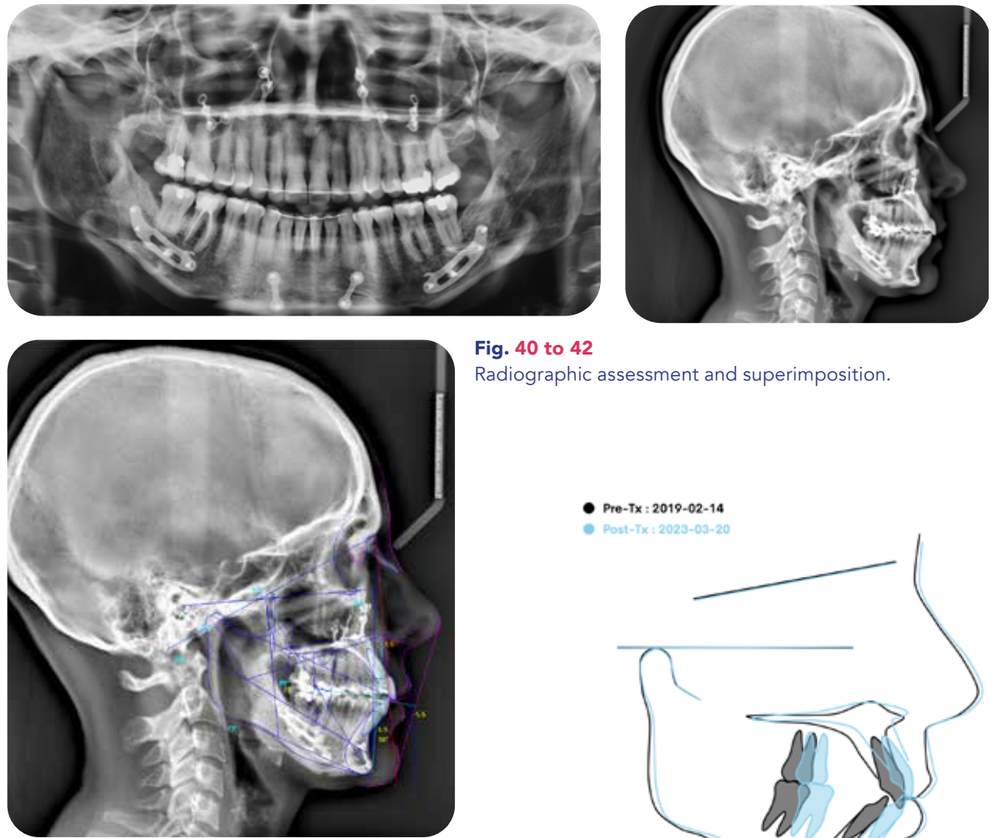


Fig. 40 to 42
Radiographic assessment and superimposition.

Fig. 43
Superposition.

DISCUSSION

This treatment highlights the crucial importance of taking the periodontal environment into account when planning and carrying out orthodontic-surgical treatment in adults. The initial presence of thin periodontal tissue, combined with anterior mandibular gingival recession and orofacial dysfunctions, constituted a major risk factor for long-term stability.

At the end of the active phase, a slight worsening of gingival recession was observed, linked to the vestibular tooth movement required to resolve crowding, despite the use of osteogenic distraction.

Nevertheless, this approach made it possible to avoid premolar extractions by facilitating space creation within a constrained periodontal context.

Furthermore, the decision to perform maxillary osteogenic distraction was also based on the need to preserve the periodontium, given the lack of potential for clinical alveolar expansion. This approach made it possible to increase the transverse dimensions without placing additional stress on a compromised periodontium, illustrating the value of a personalised strategy that takes biological limitations into account. Today, the use of a screw-retained splint could have been considered to limit periodontal stress.

To date, the stability of the periodontium, observed since 2023, appears to be closely linked to the improvement in orofacial functional balance.
Maxillofacial and speech therapy, combined with correction of the skeletal foundations and management of muscular hypertonia,

Fig. 44 to 51 :
Photographic review three years later.

has helped to restore a more favourable functional environment.
This functional stabilisation is a key factor in the long-term success of orthodontic treatment, in line with the concepts that muscular balance determines tissue stability. This is consistent with the principles developed by Robert M. Ricketts, according to which muscular and functional balance is a major determinant of the stability of orthodontic results (‘form follows function’).

In this context, performing mucogingival surgery at a later stage appears to be more advantageous, as the stability of the functional environment suggests that the results are likely to be more durable.

Furthermore, the correction of Class II Division 1 malocclusion also halted the compensatory mandibular protrusion, thereby limiting joint stress.

Thus, this case highlights that long-term stability depends not only on orthodontic and surgical correction, but also on the management of functional and periodontal factors, the interaction of which directly influences tissue development.

The psychosocial dimension of pain

Part 2

Dr Wacyl **Mesnay**
SQODF
France
wmesnay@gmail.com

Find the part 1 of the article by scanning this QR code.

THE ROLE OF THE ORTHODONTIST

For an orthodontist, the primary concern is to recognise the various ‘painful forms’ of TMJ disorder, particularly at the start of and during orthodontic treatment.

Managing painful symptoms is often within the remit of a practitioner not specialising in pain management; particularly when the pain is recent or caused by an orthodontic appliance during treatment.
However, there are cases where it is necessary to refer patients to specialist facilities. Muscle disorders are the main reason for seeking treatment for ‘TMJ’.

Changes in nociception during the autonomic hyperactivity caused by states of stress are likely to increase pain perception, but also to contribute to the chronicity of the pain. In other words, emotional states linked to psychosocial stress cause autonomic hyperactivity. This is responsible for both bruxism and pain hypersensitivity in the muscles.

Current clinical studies (11) identify three types of ‘painful behaviour’.
> **Type I** involves purely nociceptive pain, within a psychosocially balanced context;
> **Type II** involves pain exacerbated by anxiety or psychosocial distress;
> **Type III** involves chronic pain.

This is linked to a dysfunction of pain somaesthesia, often associated with a depressive state.

Clinical symptoms can be identified during the consultation with the patient. Treatment management varies according to the type of behaviour.

SYMPTOMS AND TREATMENT ACCORDING TO DIFFERENT TYPES OF PAIN

Type I patient

Type I symptoms and pain behaviour

The patient presents with nociceptive pain. The pain occurs exclusively during masticatory function, such as during chewing or mouth opening.

The patient's history reveals an identifiable precipitating event responsible for the onset of pain, for example following excessive masticatory effort. In orthodontic practice, this most commonly occurs in patients undergoing active orthodontic treatment.

The orthodontic appliance has exceeded the patient's adaptive capacity. This situation most frequently arises with intermaxillary elastics, mandibular advancement appliances, a significant increase in the vertical dimension induced by splints, or the use of appliances such as tooth positioners or clear aligners.

In most cases, the condition corresponds to a mild muscular and/or temporomandibular joint injury, resulting in inflammatory-type pain that may progress to a muscle-related limitation of mouth opening (muscular trismus).

Clinical examination reveals a clearly localized painful area. Pain is elicited only during mandibular movements, such as chewing or mouth opening.
There is no impairment of the patient's emotional, social, or occupational functioning.

Management of Type I Pain

Treatment consists of temporarily discontinuing the active orthodontic appliance, prescribing analgesic medication (NSAIDs), and promoting gradual recovery through therapeutic exercises together with advice aimed at reducing functional loading of the mandible.
These recommendations are accompanied by a patient information booklet (available for download) (16).
A retro-incisal bite plane or an anterior occlusal stop (AOS) may also be used as an adjunct to trea treatment.

Fig. 1
A temporomandibular disorder (TMD) may be present before or during orthodontic treatment. Pain is the main reason for consultation.

Type II patient

Clinical presentation and pain behaviour in type II patients

The clinical presentation is dominated by spontaneous pain affecting the masticatory muscles. This pain may occur upon awakening or develop during the day, particularly in the late afternoon. It may also be accompanied by pain during chewing or mouth opening (nociceptive pain). Other musculoskeletal pain complaints are frequently reported, including headaches, neck pain, and low back pain.

From a behavioural perspective, these patients primarily present with sleep disturbances and, in some cases, gastrointestinal symptoms. The clinical features observed in Type II patients are consistent with a pain disorder. These findings are indicative of dysfunction of the endogenous pain regulatory mechanisms associated with psychosocial distress. In such cases, both physiological and psychosocial factors must be taken into consideration.

The role of the general practitioner is crucial in preventing the progression from a pain disorder to chronic pain.

The Type II pain profile remains a sensitive issue in dentistry. The occlusal paradigm traditionally advocated by gnathologists continues to persist in some medical and allied healthcare settings (17). Consequently, orthodontic treatment may be incorrectly identified as the cause of the patient's symptoms by healthcare professionals who are insufficiently informed about current pain science.

Management of type II patients

Management combines the conventional treatment described for Type I patients with patient education regarding the influence of psychosocial factors on pain. In most cases, patients readily understand this explanation because they are experiencing a difficult period in their lives. This discussion often helps them become aware of their overall physical and psychological condition.

To facilitate this therapeutic dialogue, particularly for clinicians who are less familiar with a biopsychosocial approach, a patient information booklet (16) may be provided. The booklet addresses the questions patients commonly ask and includes practical advice, therapeutic exercises, information on the different oral appliances that may be recommended, and an introductory stress management technique.

$Patients may also be referred to the website atm-guide.fr, which provides comprehensive information, including a frequently asked questions section available under the "Public Area" tab (16).

Prosthodontic or orthodontic treatment is strongly discouraged while mandibular pain is still present. Symptom relief should rely exclusively on reversible, conservative, and non-invasive therapeutic approaches.

Type II pain frequently involves multiple body regions. It typically presents as musculoskeletal pain, most commonly affecting the cervical region, the lumbar spine, or manifesting as tension-type headaches.

These symptoms are unrelated to orthodontic treatment, and orthodontic intervention is not indicated for the management of these frequently misdiagnosed pain conditions.

Type III patient

Clinical presentation of type III patients

Type III corresponds to a chronic pain disorder. The hallmark clinical feature is persistent pain of moderate intensity, punctuated by episodes of more severe pain. These symptoms have been present for more than six months, and often for several years.

Patients typically present with widespread pain, reporting multiple painful sites involving both the orofacial region and other parts of the body, without any clearly identifiable underlying pathology. These findings are indicative of dysfunction of the somatosensory pain-processing system.

Patients also commonly present with functional disorders or other chronic conditions (comorbidities).
Symptoms suggestive of depression may also be present. In many cases, patients have previously consulted multiple healthcare professionals without obtaining relief and are experiencing a prolonged diagnostic and therapeutic odyssey ("medical wandering").

Management of type III patients

Patients with Type III pain often seek definitive treatment, requesting radical dental, occlusal, or surgical interventions. However, all invasive procedures are strongly contraindicated in this clinical context.
Given the complexity of this pain condition, management should be multidisciplinary, combining medical and psychosocial care.

Patients should be referred to a specialized multidisciplinary pain clinic with an appropriate referral letter. When such a facility is unavailable, referral to the patient's primary care physician, a neurologist, or a physician specializing in pain medicine is recommended.

The clinician's role is primarily to educate and appropriately refer the patient. However, some patients may initially deny the nature of their condition or be reluctant to engage in this treatment pathway. Several patient organizations dedicated to temporomandibular disorder–related chronic pain now provide reliable educational resources that may help clinicians explain the condition and facilitate patient acceptance (https://tmj.org).

SUMMARY

Type I patients present with pain of purely organic origin, which is generally benign. Management follows the conventional principles used for inflammatory pain conditions.

Type II patients experience pain that is amplified and maintained by autonomic nervous system hyperactivity associated with psychosocial stress. The clinician's role is to help patients understand the relationship between their overall health status and their pain. Educational tools are available to support this process. The primary objective is to achieve pain resolution and prevent progression to chronic pain.

Type III patients are frequently—and incorrectly—labelled as having a "psychological" disorder because of the absence of objective clinical findings despite marked psychosocial distress. In reality, these patients present with dysregulation of the endogenous pain modulation system. Clinical assessment typically reveals persistent background pain with recurrent exacerbations affecting multiple anatomical sites.

The clinician's role is to provide appropriate information and refer the patient to a specialized pain management service. Dedicated healthcare professionals and multidisciplinary pain centres are specifically equipped to manage these complex chronic pain conditions.

WARNING

In addition to musculoskeletal temporomandibular disorders (TMDs), other orofacial pain conditions may occasionally be encountered. In most cases, these conditions have already been diagnosed by the patient's primary care physician.

QUESTIONNAIRE « TROUBLES TEMPORO-MANDIBULAIRES »

Nom: .....Prénom: .....Date:.....

QUESTIONNAIRE « DOULEUR »

Complétez le questionnaire suivant si vous avez une douleur à la mâchoire;
Sinon passez aux étapes suivantes:

	OUI	NON
La douleur est-elle provoquée par les mouvements de la mâchoire, comme la mastication ou le bâillement par exemple?		
La douleur arrive-t-elle, le matin au réveil, dans la journée ou le soir, sans rapport avec les mouvements de la mâchoire ou la mastication?		
La douleur est-elle toujours présente en arrière fond?		
La douleur est-elle provoquée par le contact de la peau ou la gencive?		
La douleur arrive-elle en décharge brusque?		
Avez vous d'autres zones douloureuses dans le corps?		
L'intensité de votre douleur (sur une échelle de 1 à 10)		
Inférieure à 5/10		
Supérieure à 5/10		
La durée de votre douleur (Depuis combien de temps avez vous cette douleur?)		
Moins de 3 mois		
Entre 3 et 6 mois		
Plus de 6 mois		
SANTÉ GÉNÉRALE		
La façon dont vos dents se rencontrent vous paraît-elle confortable?		
Votre sommeil est il perturbé?: difficultés d'endormissement, réveils nocturnes..		
Etes vous sujet aux troubles digestifs?: Difficulté à digérer; constipations; allergies…		
Avez vous d'autres douleurs fréquentes: Maux de dos, Cervicales, Tête…		
FACTEURS DE STRESS		
Avez vous connu un changement de vie important récemment?		
Vivez vous un situation difficile ou stressante?		
Si oui êtes vous aidé?		
Etes vous une personne anxieuse?		

Fig. 3
The TMD Pain Questionnaire

The questionnaire is designed to identify the different pain phenotypes, as well as pain intensity and duration. Particular attention should be paid to the questions addressing general health and stress, as these help identify the psychosocial dimension of the patient's condition and determine the corresponding pain phenotype.

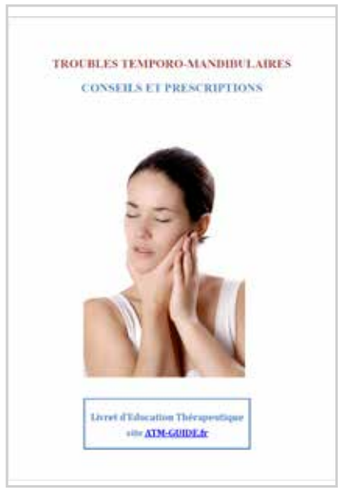


Fig. 4

You can download the patient information booklet, which provides educational information and practical guidance for treatment, by scanning the QR code below.

PAIN PHENOTYPES	DEFINITION	PHYSIOLOGY	PSYCHOSOCIAL	ASSOCIATED SIGNS
TYPE I	Nociceptive pain	Excessive peripheral nociceptive input	Adaptive psychosocial profile	None
TYPE II	Acute nociplastic pain disorder	Pain signal amplification	Physiological and psychological stress	Autonomic symptoms: insomnia, headaches, etc...
TYPE III	Chronic nociplastic pain disorder	Dysfunction of the pain somatosensory system	Chronic stress Anxiety Depression Diagnostic and therapeutic odyssey	Widespread pain Chronic comorbidities Depression

Table 1
Diagnostic classification of pain phenotypes.

The conditions that may rarely present in an orthodontic practice include:

> Temporomandibular joint osteoarthritis (TMJ osteoarthritis): characterized by joint pain perceived in the ear region, with symptoms that fluctuate over time in a waxing-and-waning pattern. The diagnosis relies primarily on imaging, which demonstrates degenerative changes and deformation of the articular surfaces.

> Trigeminal neuralgia involving the mandibular division (V3): characterized by brief episodes of severe electric shock-like pain, often associated with sensory disturbances affecting the buccal mucosa and, in some cases, the presence of a trigger zone, where light contact provokes pain.

> Cluster headache: characterized by excruciating, disabling, recurrent pain localized to the temporal, orbital, and zygomatic regions. This is an uncommon disorder that predominantly affects men.

CONCLUSION

Current evidence consistently supports the existence of three distinct pain phenotypes.

Patients with preserved psychosocial functioning are generally straightforward to manage. This category is of particular relevance to orthodontists when the therapeutic appliance is responsible for the patient's symptoms.

Patients exhibiting signs of psychosocial distress related to stress or anxiety, in whom treatment outcomes are largely determined by their psychosocial status.

Patients presenting with severe mood disorders or depression. These individuals require referral to specialized multidisciplinary pain management services.

Assessment and treatment should be individualized, taking into account the psychosocial dimension associated with each pain phenotype, in accordance with the biopsychosocial model of pain.

Finally, orthodontic treatment should not be initiated or continued while painful symptoms persist and have not been adequately managed using conservative, reversible, and non-invasive therapeutic approaches.

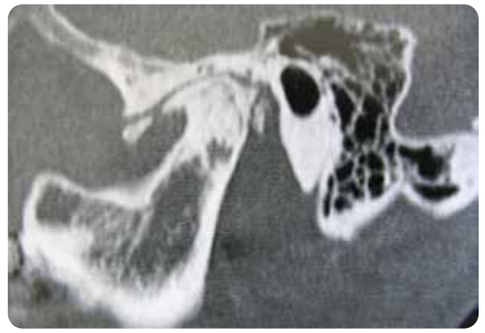


Fig. 5
Imaging of the temporomandibular joint (TMJ) is an essential component of the differential diagnosis (shown here: TMJ osteoarthritis).

PAIN PHENOTYPES	TREATMENT	PROGNOSIS
TYPE I	**Biomedical** – analgesics, nonsteroidal anti-inflammatory drugs (NSAID – occupational therapy – functional rehabilitation	Favorable
TYPE II	**Biopsychosocial** – stress information – biomedical treatment	Favorable with appropriate stress management
TYPE III	**Medical** – psychiatric care – multidisciplinary management	Uncertain

Table 2
Treatment and prognosis of pain phenotypes.

Scan this QR code to visit the website.

Fig. 6
Homepage of the ATM-GUIDE.fr website. The "Public Area" is intended for patients and provides educational information together with initial self-management advice. The "Professional Area" is reserved for healthcare professionals.

BIBLIOGRAPHY

The human spine from past to present:
posture, deformities, malformations

Djillali **Hadjouis**
Archaeologist, palaeontologist
d.hadjouis@gmail.com

We have discussed in previous articles, *Spinal Deformation and its Repercussions on Postural Balance* (2020) and *Craniofacial Morphogenesis and its Adaptive Consequences on Spinal Curvatures in Neanderthals and Modern Humans* (2024), the vital role of the spine in maintaining postural balance in the human body.

However, we have shown that from the moment upright posture was acquired, this (theoretically perfect) balance, aided by the effects of gravity, was disrupted by multiple asymmetries and imbalances, caused either by one of the spinal segments (cervical, thoracic, lumbar), or by one of the odd-numbered elements of the appendicular skeleton (lower limb) or the girdles (pelvic girdle).

In this paper, we shall focus on the numerous spinal deformities and other congenital malformations found in populations of the past.

INTRODUCTION

Comparative anatomy of the class of mammals has shown us that the species within this class have a spinal column with a similar number of vertebrae, with a few exceptions.
Generally, the spinal segments in humans consist of seven cervical vertebrae, twelve thoracic vertebrae, five lumbar vertebrae, four sacral vertebrae and four coccygeal vertebrae.

Variations in number, whether an increase or a decrease, are usually limited to one, particularly within the order of primates. As for the cervical spine, whether in a long-necked animal such as a camel or a giraffe, or a short-necked one such as an elephant or a whale, the number remains fixed at seven vertebrae.

As cervical elongation is associated with a tall vertebral body, conversely it is this height that is reduced. The variations mainly concern the posterior segments of quadrupeds and the lower segments of humans, namely the thoracic, lumbar and sacral vertebrae, or certain mammals with more than 20 thoracic vertebrae, such as hyraxes or three-toed sloths.
The table below shows the variations in number among the great apes.

PRIMATES	CERVICALS	THORACICS	LUMBARS	SACRED	COCCYGEAL
Gorilla	7	12 to 14	3 to 4	5 to 6	2 to 4
Chimpanzee	7	12 to 14	3 to 4	5 to 6	2 to 4
Orangutan	7	11 to 12	4 to 5	4 to 5	2 to 4
Gibbon	7	13	5	4 to 5	3

Table 1
Distribution of vertebrae in pongids (adapted from Le Double, 1912).

SPINAL DEFORMITIES IN HUMANS: SCOLIOSIS AND KYPHOSCOLIOSIS

In humans, the spine has a physiological S-shaped curvature.

This normal spine comprises three curves: a cervical lordosis with anterior convexity, peaking at C5; a thoracic kyphosis with posterior convexity, peaking at T8; and a lumbar lordosis with anterior convexity, peaking at L3-L4. A fourth, shorter curve is found in the sacral region, with posterior convexity.

The lowest lumbar vertebra and the first sacral vertebra, commonly referred to as the lumbosacral junction, are subject to anatomical and physiological stresses, whereby sometimes L5 slips downwards, fusing with the first sacral vertebra, or conversely, S1 moves upwards into the lumbar region, fusing with the spinous processes. Ultimately, the lumbar spine ends up, in one case, flanked by six vertebrae, and in the other by four vertebrae.
This congenital anomaly can also occur unilaterally, leading to spinal asymmetry and effects on the limbs. Vertebral deformities, that is, those involving abnormal curvatures of the spine, include scoliosis, or kyphoscoliosis, kyphosis alone, and lumbar hyperlordosis.

In structural scoliosis, there is a rotation of the vertebral bodies in which the scoliotic curvature progresses from a slight rotation, resulting in a mild deformity (anterior or posterior curvature), to the most debilitating stage.
In an isolated vertebra, the signs of this deformity aid diagnosis (vertebral body with a corkscrew appearance, deviated spinous process, unilateral compression).

Fig. 1
Anterior and left lateral views of a complete male spine, three-quarters fused due to ankylosing vertebral hyperostosis (hyperostotic disease). Significant kyphoscoliosis has developed, resulting in the loss of lordosis, Sainte Colombe Church, Chevilly-Larue.
© Hadjouis

Scoliosis may affect only one segment, most commonly the thoracic region, or it may affect both the thoracic and lumbar spine (figs. 1 and 6).

This misalignment may ultimately affect the entire spine, in other words the craniosacral system, which extends from the base of the skull/C1 (the first cervical vertebra or 'atlas') to S1 (the first sacral vertebra) (figs. 1 and 2).

The aetiopathogenesis of such a phenomenon may stem just as easily from a vertebral disorder propagating upwards to the basio-occipital region as from one propagating downwards, affecting the balance of the pelvis (figs. 7, 8, 10 and 11). It may also be caused by a pathology or abnormality of the skeleton of the limbs or girdles (fig. 8).

Kyphoscoliosis is a deformity occurring in both planes. It is secondary to congenital, infectious or other conditions (figs. 1–3). Kyphosis alone, such as that seen in Scheuermann's disease, can sometimes result in a single posteriorly convex curvature.
Scheuermann's disease, or vertebral osteochondritis, generally affects adolescents during their growth.
The condition is characterised by dorsal kyphosis, with the greatest curvature occurring between T7 and T11, compensated by lumbar hyperlordosis. It is characterised by the anterior wedge-shaped deformation of the vertebral bodies and an increase in the anteroposterior diameter, associated with irregularities in the vertebral endplates. Several juvenile individuals from medieval necropolises in the south of Paris are affected by this condition (Ardouin *et al.*, 2010).

CYPHO-SCOLIOSIS OF CONGENITAL ORIGIN

Other spinal abnormalities generally consist of lumbosacral transitional anomalies (lumbalisation, sacralisation) (figs. 7, 10 and 11), failure of apophyseal segmentation, dehiscence of the vertebral body or neural arch, and spondylolisthesis due to isthmic lysis.
We shall describe below some examples of these lesions found in populations of the past.

The most typical example of these malformations is congenital torticollis of muscular origin (lesion of the sternocleidomastoid muscle) or bone-related (unilateral involvement of the cervical spine), which leads to asymmetries in both the base of the skull and the neck region, as well as the development of thoracic scoliosis or kyphoscoliosis (Hadjouis and Thillaud, 1997).

Fig. 2
Anterior view of a complete human spine showing mild thoracic scoliosis. The lumbar vertebrae (L3–L5) show signs of infection, the symptoms of which are likely indicative of brucellosis, Parvis Saint-Christophe de Créteil.
© Hadjouis

Fig. 3
Anterior view of a kyphoscoliotic spine from a female skeleton (grave 275). The curvature indicates congenital kyphoscoliosis caused by a failure of segmentation. Charenton Protestant Cemetery in Saint-Maurice.
© Hadjouis

Fig. 4
Anterior and posterior views of the three affected vertebrae (T8–T10), although it is primarily T8–T9 that are affected by this congenital malformation. Note, in the anterior view, the dividing line between the two vertebral bodies, which remains slightly to the right. Note in the posterior view the presence of the two posterior arches of T8 on the left, separated by a trace of fusion between the vertebral bodies and the spinous process; the posterior arch of T9 is congenitally absent due to a segmental defect.
© Hadjouis

The impact on the foramen magnum is not spared, notably through its narrowing and a deformation of the occipital articular surfaces (Hadjouis, 2018).
Another extremely rare example concerns the skeleton of a woman suffering from a number of pathologies, discovered during excavations at the 17th-century Protestant cemetery in Charenton.

The complete and perfectly preserved spine exhibits congenital kyphoscoliosis of the vertebral bodies:
towards the left side (in the direction of its convexity) for the two affected vertebrae (T8 and T9), and towards the right side for the underlying thoracolumbar and overlying upper thoracic compensatory curves.

The greatest curvature peaks at the T8-T9 level. The deformation and severe flattening of the vertebrae towards the right side affected three thoracic vertebrae (T8 to T10); the first two are fused, whilst the third is not.

At the level of the spinous processes, on the left the posterior arches are present, separated by a trace of anky- losis of the vertebral bodies and spinous processes, still visible; on the right, only the zygapophyseal arch of T8 and the superior costal joint (T7 and T8) are present; those of T9 are congenitally absent (Figs. 3 and 4).

The lower compensatory curvature manifests as a significant curvature, given the pronounced vertebral angulation located higher up.

Fig. 5
Bamboo-shaped thoracic and lumbo-sacral spine, preserved by the fully fused zygapophyses, whilst the lateral and anterior elements of the vertebral bodies are completely destroyed. The retrospective diagnosis suggests ankylosing spondylitis or vertebral hyperostosis (DISH), modern necropolis of the Church of Saint-Saturnin in Gentilly.
© Hadjouis

Fig. 6
Anterior view of a complete male spine, three-quarters fused due to ankylosing spondylitis (hyperostotic disease, Sainte Colombe de Chevilly-Larue Sq Bl 11).
© Hadjouis

Fig. 7
Pelvis from a female skeleton exhibiting lumbo-sacral scoliosis, accompanied by dimensional asymmetry of the lower limbs (note the asymmetrical positioning of the acetabula); the cause is a congenital anomaly of the lumbosacral junction, specifically unilateral sacralisation of L5. Saint-Pierre Church, Chennevières-sur-Marne © Hadjouis

Fig. 8
Pelvis from the skeleton of an individual who developed lumbosacral scoliosis due to S1 asymmetry, Church of Sainte-Colombe, Chevilly-Larue, France. © Hadjouis

The development of a right-sided kyphosis is localised immediately from the level of the lesion (T8). The retrospective diagnosis of such a congenital malformation is unequivocal, given its pathognomonic criteria: topography of the site, configuration of the posterior arches, fusion of the vertebral bodies and lateral flattening. This is indeed a case of congenital scoliosis due to a segmentation defect (Hadjouis, 2018, Dufour et al., 2019). The congenital condition generally occurs around the fourth embryonic week.

FORMS OF SPINAL DISORDERS IN HUMANS

Spondylarthrosis

Spinal deformities are generally congenital, infectious, degenerative or traumatic in origin. Spinal abnormalities should also be included.
Osteoarthritis of the spine, or spondylarthrosis, affects all segments without the patient necessarily being elderly. Although it arises from various causes (enthesopathy, discopathy), the clinical diagnosis of spondylarthrosis appears straightforward at first glance, given its common occurrence across all populations.

Spondylarthrosis is a condition characterised by osteophytosis developing horizontally from the edges of the vertebral body without affecting the vertebral endplates. The preservation of the integrity of the intervertebral space therefore appears to be a feature not only of spondylarthrosis, but also of ankylosing spondylarthrosis (diffuse idiopathic hyperostosis) or DISH (Thillaud, 1996).
This latter hyperostotic condition, known as 'Forestier and Rotès-Querol disease' and which only becomes common in old age, is characterised by the presence of a bony mass along the right anterolateral edge of the thoracic spine, fusing the vertebral bodies of three to four vertebrae, whilst preserving both the integrity of the intervertebral spaces and that of the interapophyseal joints (figs. 1 and 6).

The absence of sacroiliac ankylosis distinguishes it from ankylosing spondylitis. Vertebral osteoarthritis of the posterior processes also contributes to the narrowing of the vertebral foramen, particularly in the lumbar segment. Other degenerative changes affecting the intervertebral disc occur alongside spondylarthrosis, resulting in subchondral erosion and vertebral collapse.

This discarthrosis, although very common in the cervical spine (cervicarthrosis), is also present in other spinal segments (fig. 9).

Ankylosing spondylitis

More severe than its counterpart, spondylarthrosis, the inflammatory form of ankylosing spondylitis affects multiple joints. The damage caused by spinal lesions results in an asymmetrical posture and, at the same time, exacerbates the condition by restricting movement.

Fig. 9
Cervical vertebrae viewed from above, belonging to a young adult exhibiting signs of cervical osteoarthritis, from the modern necropolis of the Church of Saint-Saturnin in Gentilly. © Hadjouis

Ankylosing spondylitis can sometimes cause ankylosis of all the vertebrae, including the sacroiliac region, which is what distinguishes it from ankylosing spondylosis (Hadjouis, 2006) (figs. 16–18).

The modern cemetery of the Church of Saint-Saturnin in Gentilly has yielded the burial site of an incomplete male skeleton, preserved by the right parts of the upper limb, the hip bone, the right hemithorax and the thoracolumbar segments of the spine.

It is the latter that is of particular note, due to the almost complete fusion of the vertebral bodies and the zygapophyseal elements of the lower thoracic spine (T9 to T12) and the lumbosacral spine (L1 to L5) and S1–S2 of the sacrum.

In this bamboo-shaped spine, only the fully fused zygapophyses remain, whilst the lateral and anterior elements of the vertebral bodies are entirely destroyed by a phenomenon of differential preservation (fig. 5).

Fig. 10
Anterior view of a sacrum from an incomplete adult skeleton. The marked asymmetry of S1 is the result of lower lumbosacral scoliosis, Saint-Nicolas Church, La Queue-En-Brie. © Hadjouis

Fig. 11
Anterior view of the same sacrum articulated with L5. The curvature of the lumbar spine suggests a marked tilt towards the right side, Saint-Nicolas Church, La Queue-En-Brie. © Hadjouis

Fig. 13
Posterior and anterior views of the odontoid process showing erosion and proliferation. Cervical erosions, particularly those affecting the odontoid process, are one of the signs of rheumatoid arthritis and ankylosing spondylitis, LQB S100. © Hadjouis

Fig. 12
Posterior view of the cervicothoracic spine (C2 to T2). Note the eroded and hypervascularised nature of the bone proliferation at the back of the odontoid process, LQB S100. © Hadjouis

Residual fragments of certain vertebral bodies show that the integrity of the intervertebral space is nevertheless preserved in its inner part, but the intervertebral height is completely reduced.
The syndesmophyte-type anterolateral ankylosis (fairly advanced syndesmophyte) completely covers the spaces and there is no evidence of osteophytosis or discopathy suggestive of spondylarthrosis (discarthrosis).

The presence of lumbosacral ankylosis due to osteoplastic lesions in its posterior region is not sufficient to suggest sacroiliitis, given the lack of preservation of the lateral elements with both ilia; however, the bamboo spine in its thoracolumbar and lumbosacral segments supports a diagnosis of ankylosing spondylitis.

Fig. 14
Facet for the odontoid process of C1 showing marked depression with flattened margins due to degenerative articular remodeling (eburnation and polishing), modern cemetery of Saint-Saturnin Church, Gentilly, France © Hadjouis.

Fig. 15
View of the C1–C2 articulation showing severe cervical osteoarthritis (or inflammatory arthritis). The pathological changes affecting the odontoid process (eburnation, osteophyte formation, etc.) are suggestive of either rheumatoid arthritis or ankylosing spondylitis. Modern cemetery of Saint-Saturnin Church, Gentilly, France. © Hadjouis

The retrospective diagnosis is ankylosing spondylitis, although a differential diagnosis of vertebral hyperostosis or DISH (Diffuse Idiopathic Skeletal Hyperostosis) is also considered.

With the exception of a rib fused to the costotransverse joints, there are no elements of the appendicular skeleton oriented in any particular direction. Another medieval subject from the necropolis of the Church of Saint-Nicolas in La Queue-en-Brie concerns the spine of a man aged around fifty.

Degenerative lesions affecting all segments of the spine suggest ankylosing spondylosis (bone spurs along the right anterolateral margin of the thoracic spine, intact intervertebral spaces) (figs. 12 and 16), whilst other criteria are more consistent with ankylosing spondylitis in rheumatoid arthritis (erosion and burning of the odontoid process, squaring of the vertebral bodies, sacroiliac fusion) (figs. 13 and 14).

Diagnoses may reflect both the retrospective and differential presentations, in one or the other.

Fig. 16
Right anterior three-quarter view of the thoracic spine. LQB S100

Fig. 17
Anterior view of the lower thoracic and lumbosacral spine showing coalescence of the vertebral bodies and processes while preserving the intervertebral space, together with osseous proliferation and ossification of the ligamentum flavum. LQB S100. © Hadjouis

Fig. 18
The sacrum is fused to the lumbar spine and to the left hip bone. The different spinal segments are partially fused by syndesmophytes and vertebral osteoarthritis (cervical arthrosis, thoracolumbar arthrosis, lumbosacral and interapophyseal arthrosis). The preservation of the intervertebral space and the sacroiliac fusion clearly suggest ankylosing spondylitis. LQB S100. © Hadjouis

BIBLIOGRAPHY

- Ardouin, S. *et al.* (2010). Extension et chronologie de la nécropole médiévale de Créteil (Val-de-Marne). *Revue Archéologique d'Île-de-France, 3*, 149-176.
- Dufour, J. Y. (Ed.). (2019). *Les fouilles archéologiques du temple et du cimetière huguenots de Charenton*. Honoré Champion, Paris.
- Hadjouis, D. (2006). *Asymétries, les leçons de l'histoire. XIIIes Journées internationales du Collège national d'occlusodontologie : Diagnostic et traitement des expressions cliniques de l'asymétrie*, Bordeaux, (DVD-ROM).
- Hadjouis, D. (2018). *Atlas des maladies et traumatismes du monde médiéval et moderne: Ve siècle-XVIIe siècle*. ISTE Group.
- Hadjouis, D. (2020, novembre). La déformation vertébrale et ses répercussions sur l'équilibre postural. Société Bioprogessive Ricketts, 30-39.
- Hadjouis, D. (2024). La morphogenèse cranio-faciale et ses conséquences adaptatives sur les courbures du rachis du néandertalien et de l'homme moderne. Société Bioprogressive de Ricketts, 15, 26-33.
- Hadjouis, D., & Thillaud, P. (1997). Analyse de plaques pleurales calcifiées provenant des nécropoles médiévales. Étude de deux cas. *Biométrie humaine et anthropologie, 15*(1-2), 31-41.
- Le Double, A. F. (1912). *Traité des variations de la colonne vertébrale de l'homme: et de leur signification au point de vue de l'anthropologie zoologique*. Vigot frères.
- Thillaud, P. L. (1996). Paléopathologie Humaine (human paleopathology). *Sceaux Cedex, Kronos*.

Photo credits: © Hadjouis.

A look back at the events

INTERFAC WEEK Strasbourg

20–24 April 2026

REVIEWER Dr Patrick **Guézénec**

The team.

From 20 to 24 April 2026, the College of ODF Teachers (CDEODF), chaired by **Professor Damien Brézulier,** organised the 20th inter-university week in Strasbourg with **Professor Stéphane Barthélemi,** under the auspices of **Professor Yves Bolender.**

One hundred and seventy-four trainees from all over France, including European trainees, gathered for these four and a half days of lectures and practical sessions.

The SBR took charge of the DES 2 trainees for the first two days to work on a case using the Electrodent, that magnificent typodont which is heated by electricity… no water required!

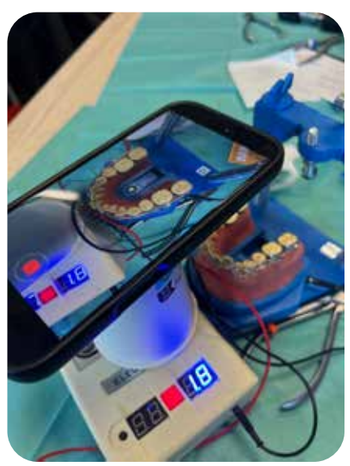
The team supervising these 58 trainees comprised academics – **Professor D. Brézulier** from Rennes, **Drs M. Rotenberg** from Toulouse, **M. -H. Nivet** from Nantes, **N. Foumou** and **C. Averlant-Dubois** from Lille, and **D. Wagner** from Strasbourg – and three private practitioners: **Drs V. Dercsar**, **R. Poitel** and myself. **J. Dercsar,** inventor of the Electrodont, was there to provide technical support.

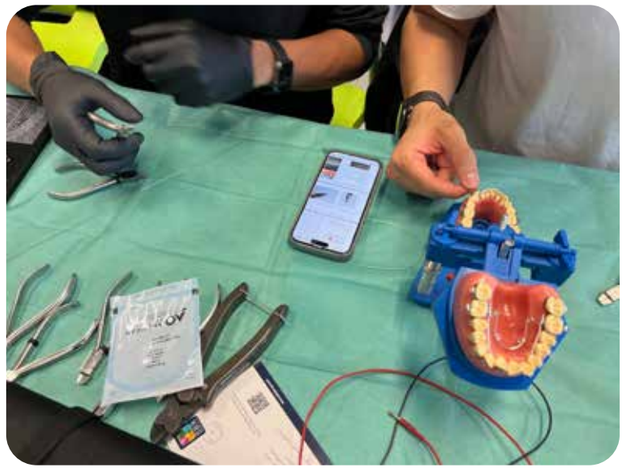
The 174 trainees gathered together and a presentation by our partners.

The SBR hired 40 Electrodonts for this course and the trainees worked in pairs.
The week began with a presentation of the programme and the partners without whom this event would not have been possible.

Following a presentation of the case we were to treat (Class II with supraclusion) and an explanation of the diagnosis and treatment plan, **Veronika Dercsar** gave a talk on the guidelines to follow to ensure the Electrodont functions correctly. I then presented the Quad-Helix and its activation, followed by a practical demonstration on our patient. During the breaks, a presentation was given on the importance of the transverse dimension and the differential diagnosis between endognathia and endoalveolia.

The afternoon began with the use of the base arch, starting with a continuous overlay arch and then moving on to a piggy-back arch.
Maxime Rotenberg provided explanations covering all the molar and incisor control points to ensure maximum effectiveness.





Desk with a syllabus on the phone.

For the first time, I saw trainees filming the movements with their mobile phones, then playing the footage back in fast-forward to visualise the movements. An interesting initiative that we plan to repeat during future sessions.

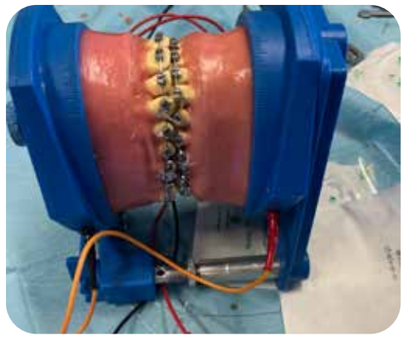
The second day began with an explanation of curved sections, used in bioprogressive orthodontics, and their application in intermaxillary traction. **Marc-Henri Nivet** gave a presentation on the use of aligners in early treatment, and

Maxime Rotenberg spoke about the use of 64 multibracket systems in these same interceptive treatments.

The afternoon began with a presentation on the various contraction and torque arches, followed by practical application and, finally, finishing arches.

The academics left us at 5 pm for a CDEODF meeting… leaving the trainees in the hands of the private practitioners!

We had dinner with the 'tweedists' team, who were taking over for the next two days whilst the trainees were at one of their evening gatherings…
Feedback from the trainees has been very positive; we're trying to cover as much ground as possible in two days, which is a challenging



Hands in the background demonstrate the technique.

task (difficulty level 3 – Rickettists will understand!). In any case, thank you to the entire supervisory team who made themselves available to answer all our questions and share their expertise.

It is sometimes difficult to 'standardise' this bioprogressive approach, as standards vary greatly between different universities.
Clearly, bioprogressive orthodontics is no longer widely taught, hence the importance for future specialists to be members of the SBR.

In its biannual journal, treated cases are presented, drawn from a variety of backgrounds, with extensive references to **Drs Ricketts and Gugino**, pioneers of modern orthodontics.

Thank you to **Yves Bolender** for his involvement in this perfectly organised week, which included a tour of the hospital's wine cellars (and a tasting!).
And thank you to the 19 partners present who provide the financial backing for organising such a gathering.

See you next year in Marseille, hosted by Professor **Michel Le Gall.**

DES2 2026.

Save the date

28es Journées de l'orthodontie

Les JO auront lieu du 6 au 8 novembre 2026. Le thème ? Soyez réaliste, demandez l'impossible ! Les femmes seront à l'honneur et l'invitée est la très fun Roselyne Bachelot, ancienne ministre de la Santé et de la Culture.

Les pré-cours, le vendredi matin, sont donnés par :
– Stella Chaushu sur les dents incluses ;
– le duo Garino-Castroflorio sur les aligneurs.
Si vous voulez valider votre DPC, c'est possible durant le congrès. Le thème ? La maltraitance physique de l'enfant : repérage et conduite à tenir face aux violences ou suspicions de violences physiques chez l'enfant en pratique professionnelle.

Plusieurs nouveautés : en plus des conférencier·ères venu·es du monde entier (traduction simultanée dans toutes les salles), une belle séance interactive de cas cliniques, et même une conférence de clôture pour finir en beauté avec Skander Ellouze le dimanche après-midi.

Nous avions de nombreuses demandes pour parler de biomécanique, de finitions, d'ancrages osseux et d'aligneurs (à l'heure où nous sont proposés des aligneurs fabriqués par des firmes et des aligneurs réalisables in-office) avec rigueur scientifique, clinique et honnêteté. Ces thèmes sont prévus cette année.

La soirée sera aux Pavillons de Bercy (Musée des arts forains et Théâtre du merveilleux) : les stands et la piste de danse seront ouverts (à moins que vous ne préfériez une barbe-à-papa ?). Féérique ! Vous retrouverez le rire de l'enfant qui est en vous.

Les séances ouvertes à l'ensemble de l'équipe (praticien·nes, assistant·es et secrétaires) auront lieu le vendredi et le samedi (n'oublions pas que la formation de notre équipe est une obligation légale).
Il y aura deux plénières : une sur l'adhérence au traitement, et l'autre sur l'IA avec des conférences très pratiques pour mettre à profit l'IA plutôt que de la subir. Vous pouvez vous inscrire et inscrire votre équipe aux ateliers : aligneurs *home-made*, stérilisation 2.0, ergonomie, *workflow*, prises de photographies, etc.

Nous exerçons une chouette profession. Nous étions 2691 l'an passé pour notre rendez-vous professionnel annuel. Un temps fort pour apprendre, échanger, communiquer et se retrouver dans les amphithéâtres, les ateliers, les stands, ou entre deux conférences autour d'un verre ou d'un bon repas. Parce que c'est aussi ça, le congrès. **Les inscriptions ouvrent en juin sur le site de la FFO.** Au plaisir de se revoir en 2026 !

Sarah Chauty, présidente scientifique, et **Jean-Michel Foucart,** président d'organisation.

La SBR aux JO

Programme des conférences

VENDREDI 6 NOVEMBRE
16 h 30 - 18 h 30

Présidents de séance : les Drs Patrick Guézénec (SBR) et Christian Minaud (Afos-AFPP)

Objectifs opérationnels visés :
- Situer les verrous qui bloquent les mouvements assurant la mastication ;
- Évaluer les moyens pour lever ces verrous ;
- Structurer une interception dans le cadre d'un traitement précoce.

- Déverrouillage de l'occlusion pour corriger la classe II : indication du plan rétro-incisif
> Laurent Delsol – OD

- Déverrouillage fonctionnel : l'apport de la rééducation assistée par le MyoSimple
> Dr Philippe Amat – ODF

- Correction de la déviation mandibulaire après déverrouillage transversal
> Dr Romy Moison – ODF

- Liberté de mouvement pour une mastication sans contrainte
> Dr Jean-Louis Raymond – ODF

- Orthopedic correction for class III on growing patient
> Dr Mauricio Gonzalez Balut – ODF

- Apport de l'échographie à la rééducation oro-myofonctionnelle (ROMF) : intérêts et limites
> Dr Patrice Nicolleau – Laboratoire Innova Pharm – ODF

SAMEDI 7 NOVEMBRE
9 h – 12 h 30

Les ATM face aux évolutions thérapeutiques en ODF
Présidents de séance : les Drs Marie-Paule Abs, Pascal Garrec et Guillaume Lecocq

Objectifs opérationnels visés :
- Identifier les signes dysfonctionnels des ATM et questionner les liens potentiels selon les thérapeutiques orthodontiques actuelles : multiattaches, aligneurs, techniques hybrides, mécaniques élastiques interarcades, cales… en illustrant ces différentes situations cliniques. Comment prévenir les risques d'apparition de ces dysfonctions et adapter les attitudes thérapeutiques lorsqu'elles surviennent ?
- Synthétiser les différentes situations cliniques pour mettre à jour un guide décisionnel selon les types de traitement orthodontique envisagé.

- Hommage au Pr Daniel Rozencweig, père du Sadam
> Dr Georges Rozencweig – ODF

- La dynamique de l'ATM et sa physiopathologie
> Dr Hélène Citterio – Odonto

- TMD, and what about the Meniscus?
> Dr Mauricio Gonzalez Balut – ODF (Loma Linda, États-Unis)

- Appel à communication
- Plaidoyer pour protéger les ATM lors de l'avulsion des dents de sagesse
> Dr Quentin Legendre – ODF

Pause et visite de l'exposition

- Douleurs orofaciales et DTM selon les thérapeutiques ODF actuelles
> Dr Ambra Michelotti – ODF

- Le mariage des aligneurs et des ATM pour le meilleur et pour le pire
> Dr Ahmed Elloumi – ODF

- ATM et ODF en 2026
> Dr Sylvain Chamberland – ODF (Canada)

CONGRÈS DE LA SBR

BARCELONE

HILTON AVENIDA DIAGONAL

2, 3 et 4 OCTOBRE 2026

Coordonné par la région Sud-Ouest

Infos et inscription

SYMBIOSE CHIRURGICO-ORTHODONTIQUE : LA NOUVELLE DONNE

Sous la présidence scientifique du Dr Maxime Rotenberg

FFO

SOCIÉTÉ BIOPROGRESSIVE RICKETTS - www.bioprog.com

SBR SOCIETE BIOPROGRESSIVE RICKETTS

LE MOT DU PRÉSIDENT

Dr Maxime Rotenberg
SQODF
Président de la SBR Sud-Ouest

Chers Amis,

Je suis impatient de partager avec vous le programme scientifique que le bureau Sud-Ouest vous a concocté sur un thème qui m'est cher : la limite orthodontie/chirurgie.

Des conférenciers de renommée internationale nous exposeront leurs limites en France, en Espagne, au Vietnam et au Japon.

Le cadre idyllique de la ville de Barcelone au début du mois d'octobre agrémentera ce programme et devrait vous compter nombreux parmi nous.

Aussi, ne tardez pas à vous inscrire dès à présent sur notre site bioprog.com.

Carpe diem

VENDREDI 2 OCTOBRE 2026

Matinée :

Hors congrès : hommage au Dr Carl Gugino
Avec sous réserve : Mme Linda GUGINO et le Dr NEZU, le Dr FUMINO, le Dr SEEHOLZER, le Dr GONZALES-BALUT.

Après-midi :

Dr Olivier Revol
Ancien Chef de Service de Neuro-Psychiatrie de l'Enfant. Responsable du Centre de Référence des Troubles d'Apprentissage (France).

Conférence inaugurale : Prise en charge chirurgico-orthodontique de l'adolescent - Aspects psychologiques

La chirurgie orthognathique et l'orthodontie ne sont pas seulement des interventions biomécaniques. Elles représentent une modulation profonde de la sphère oro-faciale, avec des répercussions neurosensorielles et psycho-sociales mesurables.
Pour les jeunes générations, pressées et préoccupées par leur image, cette transformation n'est pas une simple correction, mais une réconciliation entre l'image de soi perçue et l'image de soi projetée.
La littérature montre que les soins entrainent une amélioration significative de la qualité de vie liée à la santé, avec des gains en terme d'estime de soi et d'intégration sociale.
En somme, redessiner l'architecture maxillo-faciale, c'est aussi reconfigurer l'interface avec le monde.

Dr Jean-Louis Raymond
SQODF

Quand considère-t-on qu'une classe III est « chirurgicale » ?

La plupart des classes III sont habituellement considérées comme « chirurgicales » dès lors qu'elles sont hors de portée d'un traitement orthopédique ou orthodontique.
Mais de quelle orthopédie parle-t-on ? S'agit-il d'une orthopédie précoce ou d'une orthopédie tardive par exemple à l'aide de plaques de Bollard ?
Et la locution « hors de portée » signifie-t-elle que les objectifs du traitement sont inatteignables ? Et, dans ce cas, pour quelles raisons ?
En tentant de répondre à ces questions, on est amené à s'intéresser à la nature fonctionnelle des classes III et à l'approche systémique de leur correction.
Cette réflexion aboutit à proposer un traitement préférentiel et postule que la réhabilitation de la mastication serait un dispositif naturel de consolidation des corrections, qu'elles soient orthopédiques, orthodontiques ou même chirurgicales.

Inscription en ligne uniquement sur le site : bioprog.com

VENDREDI 2 OCTOBRE 2026

Après-midi (suite) :

Dr Arturo Vela Hernandez
Chirurgien-dentiste, orthodontiste

Traitement non chirurgical des malocclusions squelettiques de classe III

Nous présentons un aperçu des différentes options actuellement disponibles pour traiter les malocclusions squelettiques de classe III, grâce aux nouvelles techniques d'orthopédie combinées à un ancrage squelettique et aux traitements de compensation les plus avancés, tant avec des appareils fixes qu'avec des aligneurs.
Nous mettrons particulièrement l'accent sur les éléments clés permettant à un traitement NON chirurgical de dépasser les attentes du patient.

Dr Dao Quang Huy
SQODF

Traitement d'une classe III chirurgicale par cale de surocclusion et rotation mandibulaire horaire

Les cas de malocclusion de classe III causés par une croissance mandibulaire excessive, associée à une asymétrie faciale due à une déviation mandibulaire, restent un défi majeur dans les traitements orthodontiques.
Cette conférence présente une technique visant à améliorer cette situation jusqu'à un niveau acceptable évitant l'approche chirurgicale.
La technique MEAW-GEAW (multiloop edgewise arch wire et Gummetal edgewise arch wire) est ici employée pour induire une rotation mandibulaire horaire et rétablir un équilibre de la position mandibulaire.
Deux cas cliniques de patients adolescents avec des malocclusion de classe II associées à des asymétries faciales utilisant cette technique seront présentés.

Dr Pierre Cardot
SQODF

L'orthodontiste dans la tête du chirurgien

Entre l'orthodontiste et le chirurgien, c'est une vieille histoire de couple. On se côtoie, on s'écrit, on se complète, mais se comprend-on vraiment ? J'ai eu l'intuition que non, qu'il restait des zones d'ombre, des non-dits. Alors, pour dissiper ce brouillard, j'ai décidé de franchir la ligne. De passer, littéralement, de l'autre côté du mur.

J'ai interrogé dix chirurgiens maxillo-faciaux. Je ne voulais pas de réponses de manuel, je cherchais leur vérité. Comment voient-ils notre coopération ? Qu'attendent ils de nous ? Mais aussi qui fait quoi ?
Et qu'enfin, nos monologues deviennent un véritable dialogue.

Dr Magali Mujagic
SQODF

Orthodontie linguale et chirurgie orthognathique

L'orthodontie linguale est apparue dans les années 1970 aux États Unis et au Japon; son utilisation, tout d'abord réservée à quelques initiés, s'est largement étendue aux cabinets d'orthodontie classiques dans les années 2000 avec l'arrivée de systèmes entièrement individualisés rendant la gestion des traitements plus facile et permettant l'obtention de résultats thérapeutiques de haute qualité.

Au cours de cette conférence, nous verrons au travers de cas cliniques, les spécificités de la préparation orthodontique en technique linguale dans les cas chirurgicaux, la phase de finition et de contention. Enfin, nous répondrons à la question : existe-t-il des contre-indications à l'utilisation de l'orthodontie linguale dans les cas orthodontico-chirurgicaux.

Dr Romain de Papé
SQODF

Spécificités des préparations chirurgicales par aligneurs

Standardiser la préparation chirurgicale par gouttières : un protocole fiable et reproductible permettant une mise en occlusion rapide.

Par ce protocole contrôlant le plan d'occlusion post chirurgical, les risques de récidives seront maîtrisés.

SAMEDI 3 OCTOBRE 2026

Matinée :

Dr Naoyuki YOSHINO
SQODF

Traitement chirurgical ou non ? Un choix de traitement selon les besoins du patient

Le choix entre un traitement chirurgical ou non requiert une prise de décision qui va au-delà du simple diagnostic squelettique en tenant compte de l'avis et des circonstances de vie du patient. Cette conférence présente un patient dont le traitement est réalisable selon les deux options.

Les facteurs clefs qui influencent la décision (esthétique, fonctions, technique invasive, durée et contexte social) sont évalués. Au travers de ce cas clinique, nous abordons les données diagnostiques et le contexte social pour déterminer une stratégie thérapeutique.

Dr Hironobu Fumino
SQODF - Président de la BSC au Japon

Considérations sur les limites et possibilités des malocclusions squelettiques sans chirurgie orthodontique

Le traitement orthognathique est un facteur clé pour gérer les dysharmonies squelettiques, améliorant l'esthétique faciale et l'occlusion fonctionnelle grâce à la correction de la morphologie des maxillaires.

Les progrès dans la précision du diagnostic et de la bio mécanique ont élargi le champ du traitement orthodontique seul.

Cette présentation expose les limites actuelles des traitements non chirurgicaux et leurs implications dans un plan de traitement contemporain.

Pr Damien Brézulier
SQODF

L'expansion maxillaire par ancrages vissés

L'expansion maxillaire par ancrages vissés repose sur la formidable plasticité de la suture intermaxillaire chez l'enfant, mais sa fermeture progressive après la puberté impose souvent une approche chirurgicale pour une expansion efficace.

L'introduction des ancrages osseux palatins a redéfini les indications traditionnelles, rendant nécessaire une évaluation rigoureuse pour optimiser le contrôle de la dimension transversale.

Nous détaillerons les critères de choix, l'apport crucial de l'imagerie 3D (CBCT) pour une planification précise, ainsi que les principes fondamentaux de mise en œuvre de la disjonction sur appui osseux, afin d'optimiser les résultats.

Dr Gauthier Dot
SQODF

Dr Luis Carriere
SQODF

Traitement non chirurgical des classes II

Le protocole de traitement All-in-Five représente une stratégie orthodontique simplifiée et biologiquement efficiente, conçue pour obtenir une correction prévisible des malocclusions de Classe II et de Classe III en un nombre limité de rendez-vous cliniques. Fondé sur les principes de la biomécanique Sagittal First, ce protocole privilégie la correction précoce de la dysharmonie antéro-postérieure avant de procéder aux phases d'alignement et de finition.

Inscription en ligne uniquement sur le site : bioprog.com

DIMANCHE 4 OCTOBRE 2026

Matinée :

Dr Christian Calvo-Henriquez
ORL

SAHOS et multidisciplinarité

L'apnée obstructive du sommeil est une pathologie qui englobe une multitude de spécialités.
De par sa localisation (tissus mous du cou), l'ORL joue un rôle majeur dans son diagnostic et son traitement.

Dans cette présentation, nous passerons en revue le rôle de l'ORL, ce qu'il est possible de faire depuis la consultation et comment nous communiquons et travaillons avec les autres spécialités.

Dr Jérôme Bessard
Chirurgien maxillo-facial

La chirurgie orthognathique dans le traitement des SAHOS

Le nombre de patients diagnostiqués et traités pour un syndrome d'apnées obstructives du sommeil (SAOS) est en constante augmentation. La ventilation par pression positive continue (PPC) reste le traitement de référence pour les SAOS sévères (IAH > 30/H).

Ce traitement n'est pas toujours bien toléré ou accepté au long cours. Pour répondre à cette problématique, les traitements alternatifs se développent et, parmi eux, la chirurgie squelettique faciale (« bimaxillaire ») reste un des plus efficaces.

Pr Frédéric Lauwers
Chirurgien maxillo-facial

Chirurgie orthognathique précoce : jusqu'où peut-on aller ?

La chirurgie orthognathique est en perpétuelle évolution. Évolution d'abord portée par l'agressivité des réseaux sociaux, ceux des forums de patients et ceux des chirurgiens qui affichent leurs résultats. Souvent l'image devient le seul support du résultat et réduit la discussion à la modification morphologique ou esthétique appréhendée par les uns, sollicitée par les autres avec une compréhension mutuelle qui est souvent limitée. C'est dommage et probablement dommageable car ce résultat est de loin le moins prédictible.

Dans cette mouvance la céphalométrie est morte et Jean Delaire aussi d'ailleurs avec l'analyse architecturale qui était la sienne. Mais deux points restent et peuvent être mesurés : la stabilité occlusale, squelettique et dento-alvéolaire et l'équilibre fonctionnel, articulaire, respiratoire, masticatoire voire postural. Autour de ce sujet l'âge de la chirurgie, la croissance résiduelle et le risque de récidive sont encore sujets à débat. Nous avons pris le parti d'une chirurgie de plus en plus précoce et nous essaierons d'en préciser les raisons.
Dès lors, l'autre évolution de la chirurgie orthognathique est purement quantitative. Plus de demandes, plus de chirurgiens formés, plus de confiance dans la relation orthodontiste-chirurgien, plus de vulgarisation de l'information. Et cette évolution est aussi portée par des points techniques, la planification tridimensionnelle, la chirurgie guidée ou personnalisée, la RAAC ou récupération accélérée après chirurgie, la chirurgie mini-invasive... Reste la standardisation des techniques qui pourraient finir par nourrir l'apprentissage profond d'une intelligence artificielle. Il y a fort à penser que ceci ne tardera pas. Mais nos patients garderont leur singularité et l'échange et la discussion resteront la base de notre travail. En tous cas je l'espère.

SBR
SOCIETE BIOPROGRESSIVE RICKETTS

En marge du congrès : golf, visites, soirée de gala...
à découvrir sur le site de la SBR www.bioprog.com. *Inscription en ligne directement à partir du site. Toute l'information détaillée sur le congrès et inscription sur le site :* www.bioprog.com

The prevalence of bruxism and its impact on our orthodontic treatments

This dissertation was awarded second place in the 2025 Julien Philippe Prize.

Dr Karim **Cheroud**
ODF Master's Thesis: Aix-Marseille University, 2024
drcheroud@orthodontie-en-provence.fr

Thesis supervisor:
Dr Jacques **Bohar**

ABSTRACT

As there are numerous epidemiological studies, which show significant variations in the design of their survey protocols, assessing the prevalence of bruxism proves to be rather complex.

Furthermore, clinicians and posturologists have drawn our attention to the impact of bruxism on the structures of the masticatory system and, more generally, on our patients' health. In light of this, it is necessary to clarify aspects of its management.

Objectives

The main objective was to investigate the prevalence of bruxism within our department.
The secondary objective was to assess the impact of bruxism on our ODF treatments.

Materials and methods

A prospective longitudinal study was conducted. A cohort of 124 patients was recruited: during an orthodontic assessment, whilst undergoing active treatment, during follow-up, or during the retention phase. Statistical tests were performed.

Results

The prevalence of bruxism within the Marseille orthodontics department stands at approximately 26 per cent, whether it be waking, sleep-related or combined bruxism.

These figures corroborate the main epidemiological studies and call for the utmost caution regarding the orthodontist's role in the orthodontic management of patients who grind their teeth, whether in establishing the diagnosis, during active treatment or during the retention phase.

Discussion

We can highlight the issue of patients treated with aligners, where the proportion of patients developing bruxism reaches 73.3 per cent.

Aligners may not be the most appropriate solution in cases of bruxism, and the hypothesis we can put forward is that the flexible nature of aligners may exacerbate the clenching effect. This issue could be the subject of further study.

Conclusion

Bruxism is undoubtedly a common parafunction encountered in our orthodontic practice, and orthodontists can no longer afford to ignore it. The next step would be to determine more precisely the medical implications of this parafunction.

Especially as, even if the treatment was not carried out using aligners, the maxillary retainer remains the most commonly used retention device.

BACKGROUND

Contemporary scientific literature shows marked heterogeneity regarding the prevalence of bruxism, resulting mainly from differences in epidemiological survey protocols. This diagnostic complexity hinders the standardisation of clinical management, whilst clinicians and posturologists warn of the harmful impact of this parafunction on the structures of the masticatory system and patients' systemic health (1, 2, 3, 4).

It is now imperative to clarify diagnostic and follow-up protocols to ensure the long-term success of orthodontic treatments.
The BruxiC protocol was specifically developed to meet this need for clinical precision, with a view to enabling systematic investigation within the Department of Dentofacial Orthopaedics (ODF) at the AP-HM (Timone University Hospital).

STUDY OBJECTIVES

Primary objective: to investigate the prevalence of probable (wakefulness, sleep or combined) and pathological bruxism in children within the AP-HM's Dentofacial Orthopaedics (ODF) department (La Timone University Hospital).

Secondary objective: to assess the incidence and progression of bruxism during the various phases of orthodontic treatment (initial assessment, active treatment, retention), with a particular focus on patients treated with aligners.

MATERIALS AND METHODS

1. Study setting and population

This prospective, longitudinal, non-randomised study was conducted by Dr Karim Cheroud (ODF trainee), under the guidance of Dr Jacques Bohar (MCU-PH) and the supervision of Professor Le Gall (Head of Department), at the Timone University Hospital (Marseille).

The sample comprised 124 patients, aged between 7.4 and 61.7 years, recruited between November 2021 and February 2024.

Inclusion criteria: patients attending their initial orthodontic consultation for diagnostic assessment, patients of all ages, and patients undergoing either active orthodontic treatment or the retention phase.

Exclusion criteria: inability to understand or complete the questionnaires.

2. BruxiC clinical protocol

The diagnosis was based on the BruxiC protocol, developed by Dr. Estelle Casazza (Assistant Professor–Hospital Practitioner, Department of Occlusodontics).

EVALUATION du BRUXISME - QUESTIONNAIRE A REMPLIR PAR LE PATIENT

		A remplir par le patient : cocher la première colonne pour NON, pour OUI quantifier la valeur sur une échelle avec 1 (un peu), 2 (modérément) et 3 (beaucoup).	NON	OUI 1	2	3
PHASE EVEIL	1	Eveillé, avez-vous tendance à grincer des dents ?				
	2	Eveillé, avez-vous tendance à contracter vos muscles de la mâchoire, à serrer les dents ?				
	3	Eveillé, avez-vous tendance à faire bouger vos dents en serrant dessus?				
	4	Avez-vous tendance à vous ronger les ongles ?				
	5	Avez-vous l'habitude de mâcher du chewing-gum ?				
	6	Avez-vous tendance à vous mâchonner la joue, la lèvre, un objet ?				
	7	Avez-vous tendance à presser la langue, ou les lèvres, contre les dents ?				
	8	Avez-vous tendance à respirer par la bouche ?				
	9	Avez-vous des sensations de fatigue dans les muscles de la mâchoire au réveil ?				
	10	Ressentez-vous le matin au réveil des dents douloureuses ou en «carton», comme anesthésiées ?				
PHASE SOMMEIL	11	Avez-vous un sommeil difficile ?				
	12	Pensez-vous grincer des dents en dormant ?				
	13	Pensez-vous ronfler en dormant ?				
	14	Vous arrive-t-il de vous réveiller la nuit conscient que vous étiez en train de serrer les dents ?				
	15	Vous arrive-t-il de vous réveiller plusieurs fois par nuit ?				
	16	Vous arrive-t-il de vous lever afin de boire la nuit?				
	17	Avez-vous tendance à avoir la bouche sèche au réveil ?				
	18	Avez-vous tendance à être fatigué au réveil, à la somnolence dans la journée ?				
HABITUDES DE VIE	19	Avez-vous tendance à ressentir votre environnement psycho-social comme stressant ?				
	20	Vous considérez-vous comme sensible sur le plan émotionnel ?				
	21	Avez-vous tendance à absorber souvent des produits excitants (tabac, café, produits stupéfiants ... etc) ?				
	22	Avez-vous des problèmes d'acidité buccale ?				
		Liée à l'alimentation ou à la consommation de boissons acides				
		Liée à des nausées				
		Liée à des reflux gastro-oesophagiens				
BRUXISME	23	Ressentez-vous des sensibilités généralisées au niveau des dents ?				
	24	Au cours de votre vie, vous est-il arrivé de serrer ou grincer des dents ?				
		Si oui, pendant quelle(s) période(s) ?				

Table 1
Patient self-assessment questionnaire (courtesy of Dr. Casazza)

BRUXISM ASSESSMENT - TECHNICAL DATA SHEET - BRUXICL

SURNAME : FIRST NAME : DATE :

		To be completed by the practitioner: tick the first column for NO; for YES, rate the severity on a scale of 1 (slightly), 2 (moderately) and 3 (very much)	NO	YES		
MUSCULAR EXAMINATION	1	Marked density of the elevator muscles				
	2	Hypertrophy of the elevator muscles				
EXAMINATION OF DENTAL SURFACES	3	Occlusal wear: overall index (abrasion, attrition, erosion, etc.)				
	4	Attrition (bruxism)				
	5	Abrasion (third abrasive agent)				
	6	Erosion (chemical)				
	7	Abfraction (notched LCNC)				
	8	Shiny wear facets				
SOFT TISSUE EXAMINATION	9	Lingual hypertrophy				
	10	Lingual indentation				
	11	Traces of biting or sucking (inner surfaces of cheeks and lips)				
BONE EXAMINATION	12	Thick alveolar bone				
	13	Alveolar exostosis				
	14	Gonial exostosis, perimandibular calcification				
FUNCTIONAL EXAMINATION	15	Lingual dysfunction				
	16	Mouth breathing				
OCCLUSAL EXAMINATION	17	Malocclusion				
	18	Non-functional canine				
	19	Over-guidance: right incisor-canine lock, left incisor-canine lock				
	20	Group function involving more than 2 teeth per side				
	21	Limited opening movement (< 40 mm) (Value = mm)				

Table 2
Clinical Record Form BruxiC (courtesy of Dr. Casazza)

This protocol combines:

- A clinical observation form (clinical examination, photographs, optical impressions). This summary enables the 'possible' or 'probable' nature of wakefulness bruxism (WB) and/or sleep bruxism (SB) to be assessed.
- A self-assessment questionnaire (medical history). (See tables 1 and 2).

3. Statistical analysis

The analyses were carried out using RStudio (version 2024.04.2+764). Normality was tested using the Shapiro-Wilk test. For normally distributed variables, Student's t-test was applied.

For all other comparisons, the Wilcoxon–Mann–Whitney test was used. Associations between bruxism and secondary variables were assessed using the chi-square test or Fisher's exact test, as appropriate.

The level of statistical significance alpha was set at 5%.

DETAILED RESULTS

1. Sample characteristics

The sample (N = 124) showed a marked predominance of females (62.9 per cent).

	n (%)	*Age (years)*	
		Mean ± ET	[Range]
Men (1)	46 (37,1 %)	19,34 ± 12,23	[7,4 ; 56,7]
Women (2)	78 (62,9 %)	22,40 ± 12,98	[7,8 ; 61,7]
Total	124	21,27 ± 12,74	[7,4 ; 61,7]

Table 3
Demographic characteristics of the study sample.

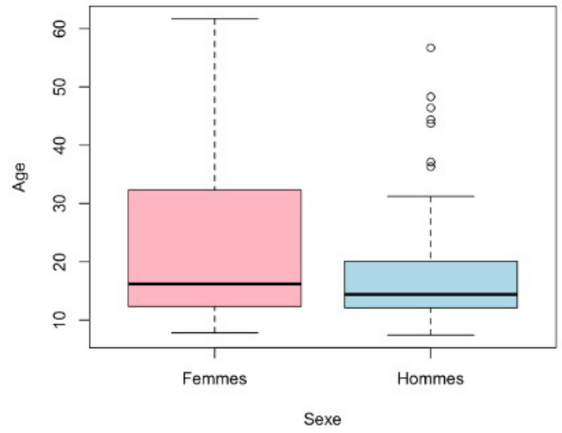


Fig. 1
Sex distribution of the dtudy sample (n = 124)

	Bruxism	No bruxism
Overall prevalence	26,73 % (W = 32,31 % ; M = 16,66 %)	73,27 % (W = 67,69 % ; M = 83,33 %)
Prevalence by bruxism type	Awake: 9,90 % (W = 12,31 % ; M = 5,55 %) Sleep: 2,97 % (W = 3,08 % ; M = 2,77 %) Both: 13,86 % (W = 16,92 % ; M = 8,33 %)	73,27 % (W = 67,69 % ; M = 83,33 %)

Table 4
Detailed prevalence at the Initial orthodontic assessment.

2. Prevalence at the time of the initial assessment

At the time of the assessment (n = 101 analysable cases), the overall prevalence was 26.73 per cent.
A gender disparity is observed: 32.31 per cent among women, compared with 16.66 per cent among men.

3. Prevalence during active treatment and maintenance

During active treatment (table 5), the prevalence remains stable at 25.88%.
By contrast, a peak of 50% is observed during the maintenance phase. However, this result should be interpreted as a clinical observation requiring confirmation, given the small sample size (n=12) at this stage of the study.

	Bruxism	No bruxism
Overall prevalence	25,88 % (W = 32,69 %, M = 15,15 %)	74,12 % (W = 67,31 % ; M = 84,85 %)
Prevalence by bruxism type	Awake: 4,71 % (W = 5,77 % ; M = 3,03 %) Sleep: 2,35 % (W = 1,92 % ; M = 3,03 %) Both: 18,82 % (W = 25 % ; M = 9,09 %)	74,12 % (W = 67,31 % ; M = 84,85 %)

Tableau 5
Detailed prevalence following treatment.

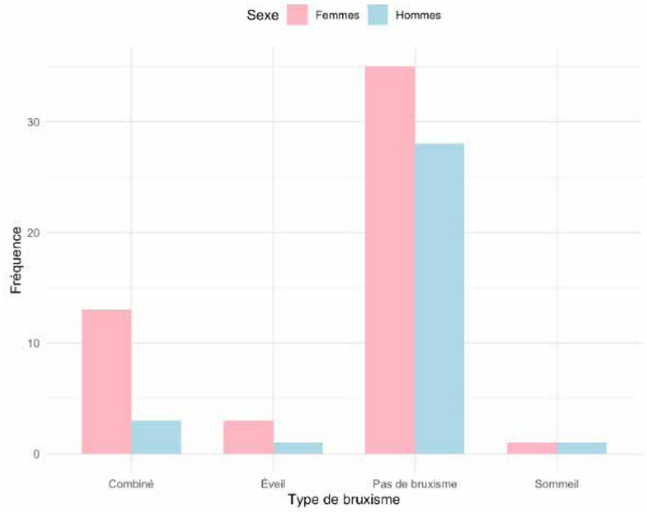


Fig. 2 : Types of bruxism during the treatment phase.

ANALYSIS OF RISK FACTORS (SECONDARY CRITERIA)

The study confirms the existence of a significant link between bruxism and several comorbidities (table 6 and fig. 3):

- **Temporomandibular disorders (TMD):** a major correlation was found during the assessment (p=0.000108). 35.7% of bruxers have TMD, particularly in the form of muscle pain.
- **Lingual dysfunction (LD):** A highly significant link was established (p=0.0002279), with a prevalence of 42.9% among bruxism patients during the assessment.
- **Obstructive sleep apnoea (OSA):** present in 21.4% of bruxism patients (p=0.003438) . This association suggests a cause-and-effect relationship linked to the rhythmic activity of the masticatory muscles (RMMA).
- **Distress:** 31% of bruxism patients report subjective distress related to the parafunction (p=0.0027).

	n (%)	*Age*	
		Mean ± ET	*Range*
TMD	15 (35,7 %)	40,91 ± 11,45[a, c]	[22,80 ; 61,70]
Tongue dysfunction	18 (42,9 %)	17,60 ± 12,14[a, b]	[8,20 ; 48,30]
Sleep-disordered breathing	9 (21,4 %)	17,41 ± 16,60[c, d]	[8,20 ; 56,70]
pain	13 (31 %)	41 ± 11,93[b, d]	[22,80 ; 61,70]
Total	42	30,15 ± 16,17	[8,20 ; 61,70]

Table 6
Prevalence of associated factors (DTM, DL, TROS, distress).

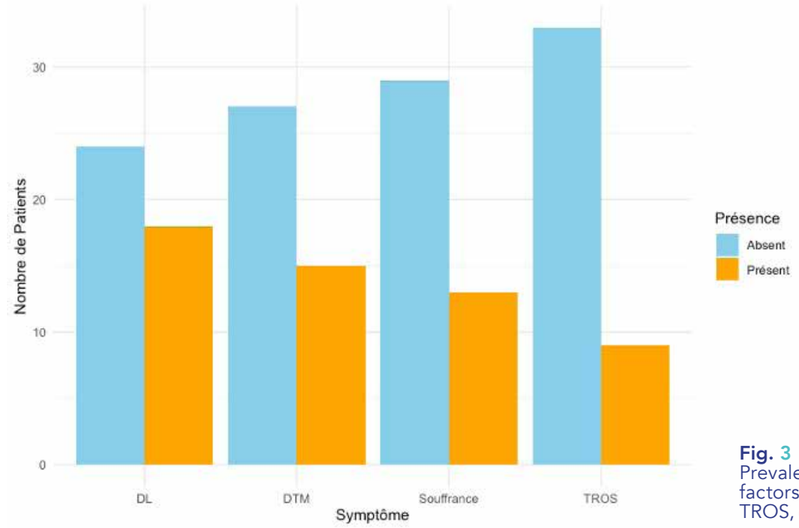


Fig. 3
Prevalence of associated factors (DTM, DL, TROS, distress).

FOCUS : THE IMPACT OF ALIGNERS

A key finding of this research concerns patients who 'develop' bruxism during treatment. Of the sample of new bruxers, **83.3% are being treated with aligners.**

The study details the profile of these patients, revealing that the majority are female (80 per cent) and have an average age of 31. The analysis suggests that the flexible nature of the aligner material may act as a sensory stimulus, triggering the clenching reflex.

		Assessment		*During the treatment*		*Total*
	n	*Bruxism*	*No bruxism*	*Bruxism*	*No bruxism*	
Men	5	2 (40 %)	3 (60 %)	2 (40 %)	3 (60 %)	5 (100 %)
Women	10	4 (40 %)	6 (60 %)	9 (90 %)	1 (10 %)	10 (100 %)
Total	15	6 (40 %)	9 (60 %)	11 (73,3 %)	4 (26,7 %)	15 (100 %)

Table 7
Prevalence of bruxism among patients undergoing treatment with aligners..

DISCUSSION

1. Comparability and gender

The observed prevalence of 26% is consistent with data from the orthodontic literature.

The predominance of female patients (particularly for BE and combined bruxism) suggests the involvement of an emotional component and a greater susceptibility to stress.

2. Associated factors and RMMA

The correlation with TROS can be explained by RMMA (5), as bruxism sometimes acts as a motor response to maintain airway patency. The link with muscular TMD confirms that bruxers develop more frequent clenching behaviours, leading to neuromuscular fatigue (6).

3. Issues with aligners

Our results call into question the routine use of aligners in confirmed bruxers. Unlike a rigid occlusal release splint, the flexibility of aligners appears to stimulate mandibular muscle activity (MMA). They would therefore act as a contributing factor rather than a therapeutic solution.

4. Biases and limitations

The diagnosis relies on subjective tools (self-assessment) which may lead to overestimation or underestimation. Furthermore, the AASM criteria do not always take into account bruxism or muscle fatigue.

Finally, dental wear is a historical sign that does not necessarily reflect current parafunctional activity (7).

CONCLUSION THE ROLE OF THE ORTHODONTIST

With a prevalence of 26 per cent, bruxism is an unavoidable clinical reality at the Timone University Hospital. The orthodontist must incorporate the BruxiC protocol from the initial diagnosis onwards in order to adapt their treatment strategy.

Whilst the impact of aligners as a trigger for clenching requires further study, a cautious approach is warranted. During the retention phase, the rigid maxillary splint remains the gold standard for protecting the masticatory structures and stabilising orthodontic results.

NOTA BENE

At a time when orthodontics is reinventing itself through the lens of responsibility — the central theme of the 2025 SBR Congress in Colmar, in which we participated — the question of the flexibility of aligners as a factor potentially contributing to bruxism calls for broader reflection: beyond their mechanical impact on masticatory muscle activity, the very composition of these polymer devices, and their potential role as endocrine disruptors upon prolonged contact with the oral mucosa, constitute a field of investigation that the orthodontics of the future will no longer be able to ignore.

BIBLIOGRAPHY

> 1. Demjaha, G., Kapusevska, B., & Pejkovska-Shahpaska, B. (2019). Bruxism unconscious oral habit in everyday life. *Open access Macedonian journal of medical sciences, 7*(5), 876.

> 2. Orthlieb, J. D., Duminil, G. (2015) *Le bruxisme, tout simplement.* Information dentaire.

> 3. Lobbezoo, F. *et al.* (2018). International consensus on the assessment of bruxism: Report of a work in progress. *Journal of oral rehabilitation, 45*(11), 837-844.

> 4. Detarvernier, E. (2019) *Bruxisme et orthodontie* [Thèse d'exercice, faculté d'odontologie de Lyon].

> 5. Manfredini, D. *et al.* (2020). Bruxism: a summary of current knowledge on aetiology, assessment and management. *Oral surgery, 13*(4), 358-370.

> 6. Maluly, M. *et al.* (2013). Polysomnographic study of the prevalence of sleep bruxism in a population sample. *Journal of dental research, 92* (7_suppl), S97-S103.

> 7. Lavigne, G. J. *et al.* (2008). Bruxism physiology and pathology: an overview for clinicians. *J Oral Rehabil, 35*, 476-494.

TOUT EST UNE QUESTION DE CHOIX

Avec des options invisibles, métalliques et molaires, associées à des configurations interactives et passives, le système complet Empower® vous permet de proposer un traitement personnalisé, adapté à votre philosophie et aux besoins de vos patients. Empower® – le contrôle entre vos mains.

CHOIX DES BRACKETS

Empower® Clear Self Ligating

Les brackets céramiques Empower Clear autoligaturants sont la combinaison parfaite de l'esthétisme et de la performance.

Empower® Self Ligating

Les brackets métalliques Empower associent les avantages de l'autoligaturant et le confort du patient.

Empower® Reconvertible SL Molars

Les tubes reconvertibles autoligaturants pour molaires Empower offrent une adaptabilité sans compromis.

CHOIX DES SYSTÈMES

- Système interactif pour une meilleure maîtrise du torque et des rotations pendant toutes les phases de traitement.
- Système passif pour des mécaniques de friction faibles tout au long du traitement.
- Le système Empower Dual Activation™ combine des brackets interactifs sur les antérieures et des brackets passifs sur les postérieures dans un système harmonisé.

American Orthodontics France, BP 22071
FR-68059 Mulhouse Cedex 2
Tél. : 03 89 66 94 80 | fr.info@americanortho.com
www.americanortho.com

BUREAU NATIONAL

Président
Dr Patrick Guézénec
Résidence Atrium
3, bd Waldeck-Rousseau
22000 Saint-Brieuc
Tél : 02 96 60 81 00
odf.guezenec@wanadoo.fr

Secrétaire nationale
Dr Charlotte Eurin
30 bd Pierre Mendes-France
77500 Chelles
sbr.eurin@gmail.com

Secrétaire adjointe
Dr Mireille Biegel
16a, rue du Château
67230 Benfeld
Tél. : 03 88 74 12 48
mireille.biegel@orange.fr

Trésorier
Dr Éric Allouch
18, rue Pasteur
92300 Levallois-Perret
Tél : 01 49 64 03 41
eric.allouch@wanadoo.fr

Trésorier adjoint
Dr Romain de Papé
14 quai Kléber
67000 Strasbourg
romaindepape@gmail.com

BUREAUX RÉGIONAUX

Région Est

Présidente
Dr Mireille Biegel
16a, rue du Château
67230 Benfeld
Tél. : 03 88 74 12 48
mireille.biegel@orange.fr

Secrétaire
Dr Gaëlle Harter
drgaelleharter@orange.fr

Secrétaire adjointe
Dr Sophie Laquille
dr.sophie.lauqille@orange.fr

Trésorière
Dr Laure Damery
141, rte de Lyon
67400 Illkirch-Graffenstaden
Tél. : 03 90 40 09 44
dr.laure.damery.odf@orange.fr

Région Ouest

Président
Dr Patrick Guézénec
Résidence Atrium
3, bd Waldeck-Rousseau
22000 Saint-Brieuc
Tél. : 02 96 60 81 00
odf.guezenec@wanadoo.fr

Vice Présidente
Dr Marie Doco
Résidence Atrium
3, bd Waldeck-Rousseau
22000 Saint-Brieuc
Tél. : 02 96 60 81 00
docteur.marie.doco@gmail.com

Secrétaire
Dr Romy Moison
4 bis, rue de la Tannerie
35160 Montfort-sur-Meu
Tél. : 02 99 09 36 00
romy.moison@gmail.com

Trésorier
Dr Michel Lemonnier
33, domaine de l'Étang-de-la-Motte
35590 Saint-Gilles
m.lemonnier.m@orange.fr

Région Île-de-France

Président
Dr Éric Allouch
18, rue Pasteur
92300 Levallois-Perret
Tél. : 01 49 64 03 41
eric.allouch@wanadoo.fr

Secrétaire
Dr Aurélie Firmin
20, av. des Arts
94100 Saint-Maur-des-Fossés
Tél. : 01 64 26 18 34
drfirmin.vincent@orange.fr

Trésorière
Dr Charlotte Eurin
38, rue Louis-Éterlet
77500 Chelles
Tél. : 01 64 26 18 34
ortho.eurin@gmail.com

Région Rhône-Alpes

Président
Dr Jean-Luc Ouhioun
jlo.com@wanadoo.fr

Trésorier
Dr Frédéric Chalas
Le Petit Pélican
Bd Albert-Lebrun
26200 Montélimar
Tél. : 04 75 51 23 12
fred.chalas@wanadoo.fr

Secrétaire
Dr Marta Garcia Montecino
12 ter rue Guilloud
69003 Lyon
gmomarta@gmail.com

Région Sud-Est

Présidente
Dr Marie-Paule Abs-Hallet
222, av. de Mazargues
13008 Marseille
Tél. : 04 91 77 23 83
abs.mpaule@gmail.com

Vice présidente
Dr Nathalie Assayag
2, bd Dromel,
13009 Marseille
Tél. : 04 91 75 42 46

Secrétaire
Dr Nicolas Boissi
2, av. Victor-Hugo
13600 La Ciotat
Tél. : 04 42 70 63 00
ortho.boissi@gmail.com

Trésorière
Dr Marie-Noëlle Marcellesi
221, av. François-Mitterrand
13170 Les Pennes
Tél. : 04 91 96 00 95
mn.marcellesi@wanadoo.fr

Région Sud-Ouest

Président
Dr Maxime Rotenberg
12, rue Louis-Braille
31520 Ramonville-St-Agne
Tél. : 05 62 17 50 50
maxrot@orange.fr

Secrétaire
Dr Isabelle Aragon
6, chemin de la Pélude
31400 Toulouse
Tél. : 06 21 85 27 91
aragon.isabelle@gmail.com

Secrétaire adjointe
Dr Carole Vargas
vargas.carole@gmail.com

Trésorière
Dr Marie-Sophie Pujos
3, rue Marie-Curie
81370 Saint-Sulpice-la-Pointe
ms.pujos@gmail.com

L'ORTHODONTIE BIOPROGRESSIVE
est la revue de la Société Bioprogressive Ricketts

infonationale@bioprog.com
www.bioprog.com

Président : Dr Patrick Guézénec
Secrétaire générale : Dr Charlotte Eurin
Trésorier : Dr Éric Allouch
Présidents d'honneur : Pr Édith Lejoyeux, Dr Alain Béry, Dr Carl Cugino †, Dr Claude Chabre, Dr Michel Delamaire †, Pr Julien Philippe †, Dr Daniel Rollet †

Rédacteur en chef : Dr Patrick Guézénec
Assistante de la rédaction : Nathalie Hamel / R du large

Directeur de la publication : Dr Patrick Guézénec
Édition et administration : Société Bioprogressive Ricketts
Conception et mise en page : R du large / Elsa Groult, Hélène Michoux
Rédacteurs adjoints : Dr Patrick Guézénec, Dr Anne-Marie Caubet-Doniat
Comité scientifique : Dr Alain Béry, Dr Jean-Michel Bonvarlet, Pr Pierre Canal, Pr Édith Lejoyeux

Impression : Imprimerie Rochelaise
Cet imprimé est certifié PEFC TM 10-31-1240

Société Bioprogressive Ricketts
Association régie par la loi du 1er juillet 1901
Revue bi-annuelle. Vol. 38 n° 1 - juin 2026

Dépôt légal : à parution. **ISSN :** 1273-7801