Traitement orthopédique des classes III par stimulation de la croissance du maxillaire

Orthopaedic treatment of class III by stimulation of the growth of the jaw

Résumé

Le manque de développement du maxillaire génère un hyperdéveloppement mandibulaire dans les 3 plans de l'espace.

Cette insuffisance de croissance est tout à fait rattrapable et majorable et d'autant plus que l'enfant est jeune avec de la croissance à venir.

L'utilisation d'appareillages fonctionnels permet aux dents maxillaires de recevoir les stimuli masticatoires, et au maxillaire de se développer dans les 3 plans de l'espace en même temps que la mandibule se repositionne.

Abstract

The lack of development of the jaw generates a mandibular hyperdevelopment in 3 plans of the space.

This insufficiency of growth can be made up for and improved, especially as the child is young and will grow.

The use of functional equipment allows the maxillary teeth to receive masticatory stimuli, and in the jaw to develop in the 3 plans of the space at the same time as the mandible repositions.

MOTS-CLEFS :

- Classe III, hypoplasie maxillaire, prognathie mandibulaire, surélévations molaires, traitement fonctionnels précoces

KEYWORDS:

- *Classe III, hypoplasie maxillary, prognathie mandibular, extra height molars, early functional treatment*

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INTRODUCTION

Heavy orthopedic treatments and surgery are often proposed as the sole therapeutic option for the resolution of mandibular prognathies and maxillary hypoplasias. Inverted articulations can be detected very early in infancy, as early as lacteal dentition.

Many authors including Mc Namara and Miyama [1] have shown that without treatment, maxillary retractions do not improve over time, while the mandibular protrusion increases. This ensemble always leads to the aggravation of the initial skeletal disharmony.

In general, parents realize early on that there is a problem with their child's jaws, and from that moment on, we need to intervene.

A loss of the vertical dimension of occlusion due to posterior bilateral edentation generates class III intermaxillary issues, as is often the case in old men who no longer have growth.

In growing children, increasing the vertical dimension of occlusion, by raising the posterior teeth, will slow down the mandibular advancement and promote maxillary growth.

HISTORY

The French school of functionalists, initially essentially composed of stomatologic doctors, has been, since Robin, dedicated from a medical point of view to skeletal disharmonies.

In this medical line, Professor Deffez led for many years the pediatric stomatology department of Bretonneau Hospitals, and then subsequently Robert Debré. Dento-Facial Orthopedics treatments were performed without a ring, using only functional removable devices [2-4]. The role of the tongue and soft tissues being essential for the shaping of bone and dental structures, these treatments were part of a global multidisciplinary medical approach: orthophonic, ENT, psychological, osteopathic...
These functional treatments without multi-attachment give excellent results before the final dentition.

Based on the work of Lepoivre [5], Def-fez [2-4] and Fellus [6] treated maxillary hypoplasia only using removable devices increasing the vertical dimension of occlusion and explained their action from a neuromuscular point of view.

Delaire [9-10] and Planas [11] also explained the architectonic and craniofacial dynamics as well as the functional development of the face by adding the role of occlusal stroking and chewing.

An antagonism between the teeth and the tongue acts as a bridge between the different functional approaches.
The tongue recedes so as not to be "eaten" when the masticatory dynamics starts, or remains between the teeth because of the suction-swallowing or the breathing through the mouth [7].

The combination of mechanical techniques with functional concepts allows us to go further with the therapeutic possibilities [8].

PRINCIPLE OF TREATMENT

Since we treat children who are growing and for whom no organ has reached adult size, it is consistent to promote the growth of the bone structure proportionately late through the alveolo-dental processes which we take as a basis.
A removable apparatus which is constantly worn increases the vertical dimension of occlusion, this will stimulate the growth of the jaw and reorient the mandibular growth.
The maxillomandibular physiological recovery in the 3 planes of the space will allow during mastication, the friction of all the upper teeth with the lower teeth.

In the case of crossed articulations or infarction, the maxillary teeth do not cover or do so incorrectly the corresponding ones, the teeth in a bad position as well as the bone on which they on are do not perceive the stimuli coming from the friction of the antagonistic teeth; while the mandible is no longer contained.

When the mandible is not retained by the jaw, its growth is not controlled and it can start in the 3 planes of the space: towards the front mandibular prognathia, the mandibular side-exoclusion, where the lower skeletal hyperdivergence is.

The basis of the treatment is the increase of the vertical dimension of the functional occlusion and the activation of all of the maxillary teeth; in lacteal dentition, a removable device alone may suffice, but as soon as the final teeth appear, we will put together glued fasteners to align the teeth and increase the desired effects.

We use a Hawley plate with an activation cylinder and extra height molars. The key factor is the thickness of the molar shims, of a large height, always greater than the free space of inocclusion.
The resin plate will be in contact with all maxillary teeth, occlusal strike and masticatory friction may be transmitted to all upper teeth, including those that were cross-articulated or inocclusive.
The removable mono-maxillary device must be worn continuously even during meals which removes all of the proprioceptive memory of the articulated cross

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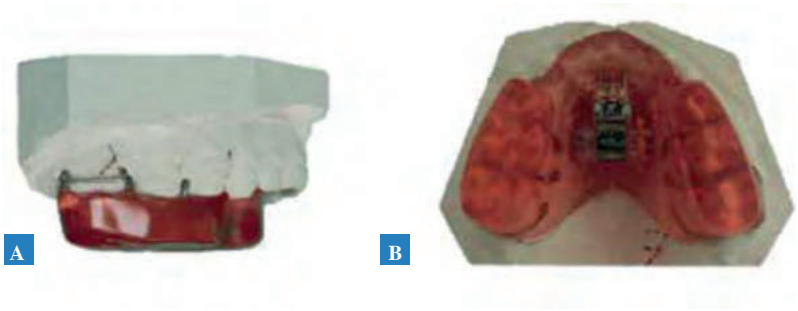

Fig. 1A et B.

and prevents any premature contact at the origin of the deviations of the closure. There is no more proglis, nor latero-deviation.

The extra height molars stimulate the growth of the jaw in the 3 directions of space.

In the anteroposterior direction

An inversion of the joint prevents any possibility of the natural expansion of the maxillary teeth, because each time it closes, they undergo a concentric force opposing the expansion of the arch. The thickness of the resin between the teeth will release the upper teeth from the pathological occlusion;
The elevated height of the extra height molars changes the orientation of the chewing forces:

From the verticals ones, they become oblique with a postero-anterior component that pushes the maxilla forward, like the mask of Delaire pulling it. Since the resin is in contact with the lingual surface of the upper incisors, the functional stresses of the occlusal friction (Deffez) [2-4] and masticatory friction (Planas) [11] are transmitted to these teeth, giving energy and leading to the expansion of this arch.

The effective height, for the anteriorization of the premaxilla, is obtained when the mandible is lowered and thus sufficiently retracted in order to simulate normal incisal ratios in the antero-posterior direction. The more you want a maxillary advancement effect, the greater the resin height must be.
The advancement and descent of the condyle into the glenoid cavity alters the orientation of ligaments and muscles, particularly the lateral pterygoids. Their axis is transformed, initially horizontal, it becomes oblique; and being upright, the muscles lose some of their propulsive action acting on the mandible.
The action of the soft tissues is modified.
In general, the tongue is very powerful in these patients and can exert its centrifugal action on the upper incisors,

which are no longer restrained by occlusion. Lateral resin holds will increase the volume available inside the dental arches, which will undergo the thrust of it.

As their thickness is greater than the free space of the inocclusion, the lateral lingual interposition between the arches is prevented and the dental proprioception is stimulated because the posterior teeth come into contact via the molar planes.

The resin palate can, by coming into contact with the tongue, recreate a tactile proprioception of the lingual dome, resulting in the elevation thereof.

The inferior orbicularis will no longer exert pressure on the released upper incisors, but rather on the mandibular teeth.
The lower orbicularis which are less tonic, will offer less resistance to lingual thrust on the maxillary incisors.

In the transverse direction

As the upper lateral teeth are embedded in the resin, activations of the expansion cylinder do not generate a coronal version of these teeth but rather a movement under pressure. The intermaxillary suture is actively solicited and there is an expanding homothetic displacement of the alveolo-dentary processes, giving the necessary place for the definitive teeth which is sufficient to align.

In the vertical direction

The molar elevation helps to close the vertical direction by going into the posterior areas covered in resin and allowing the spontaneous egression of the anterior teeth to happen. The grinding of the canine contacts that will be obtained before the incisal recovery, increases this effect. The molar planes work on the same principle as the retro-incisal elevations. The resin applied against all of the teeth, gives proprioceptive stimuli to the anterior teeth, which can be deprived of it due to an articulated cross or an infarction.

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PRESENTATION OF CLINICAL CASES

Clinical case n ° 1 (Fig.2 to16)

Little girl who is 5 years and 3 months old, she has a marked deficit of the average tier of the face. Her upper lip, very set back, has its red edge barely visible.

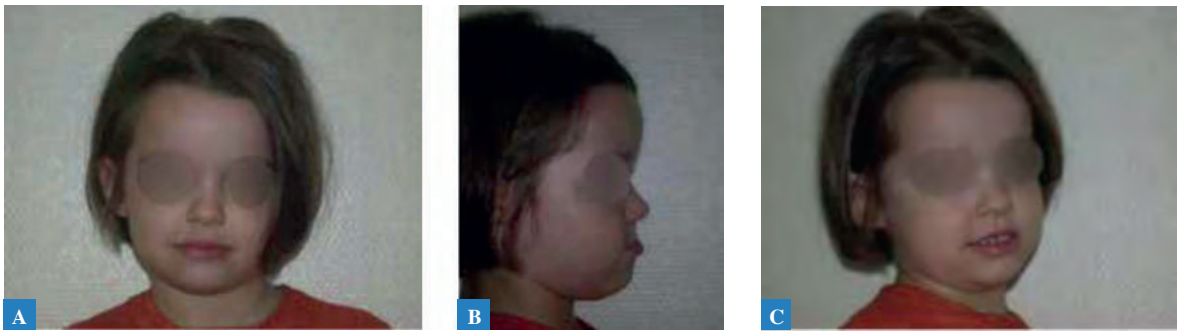
Her lower lip is everted, her smile shows her mandibular incisors (Fig.2A to C).

She is in lacteal dentition, her 6-year-old teeth are not yet developed (Fig.3A to C).

On the panoramic radiograph, as in all maxillary hypoplasias, there is a foreseeable lack of space for definite teeth in the maxillary arch, whereas they are well spaced at the super-developed mandibular arch (Fig.4).

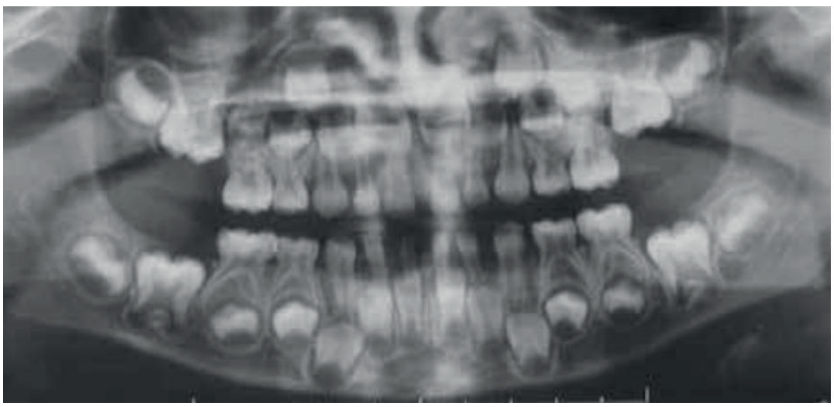
Teleradiography shows a class III aggravated by the proalveoli of the lower incisors (Fig. 5).

We used a device with molar elevations and very quickly, the jaw advanced. The effective height to cross the occlusion was obtained in 2 stages by adding resin to the base. When the incisal overhang is obtained, the height of the planes is gradually diminished by keeping the lower incisors with elastic at night (Fig.6A to I).



▲ **Fig. 2A to C.**

▲ **Fig. 3A to C.**



▲ **Fig. 4.**

▲ **Fig. 5.**

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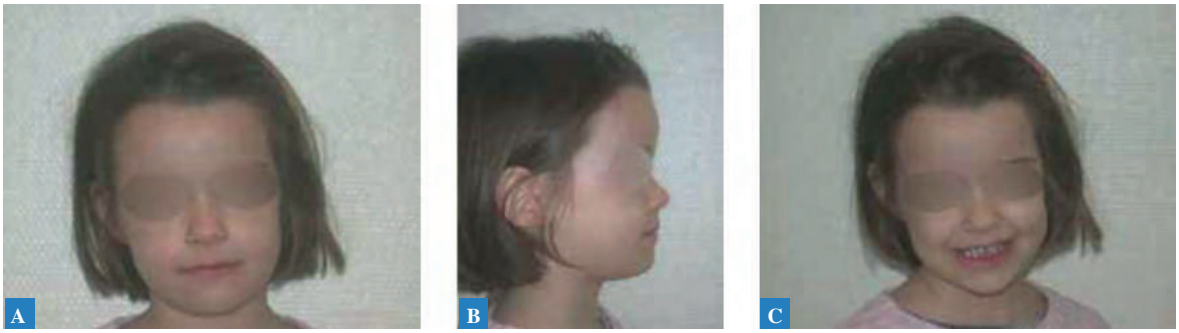
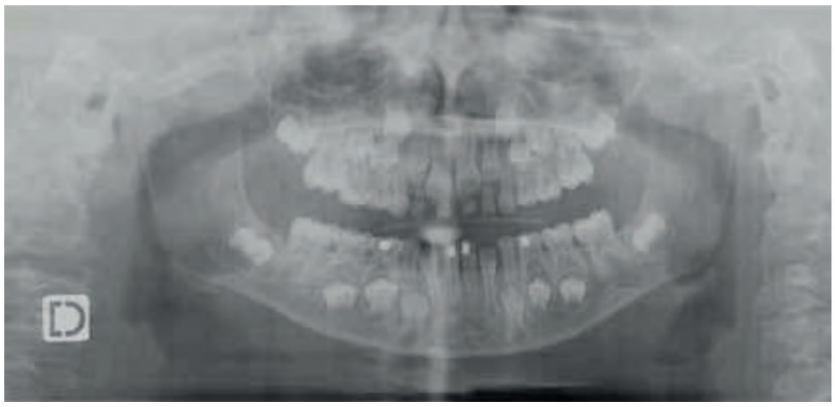
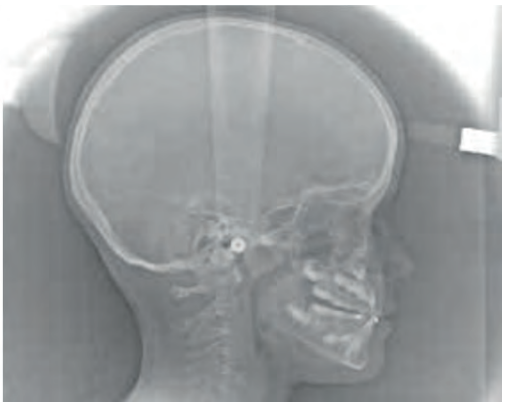
▲ **Fig. 6A to I.**



▲ **Fig. 7A to C.**

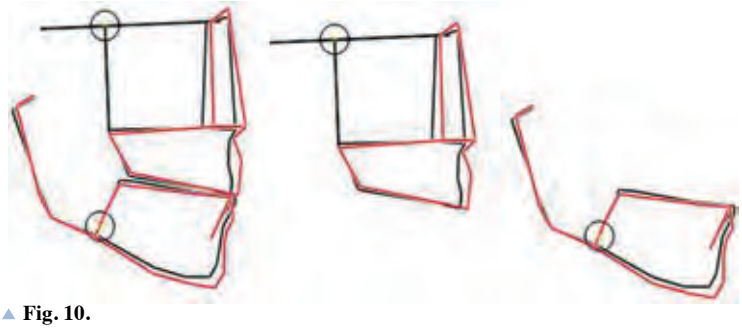


▲ **Fig. 8.**



▲ **Fig. 9.**

Superpositions



▲ **Fig. 10.**

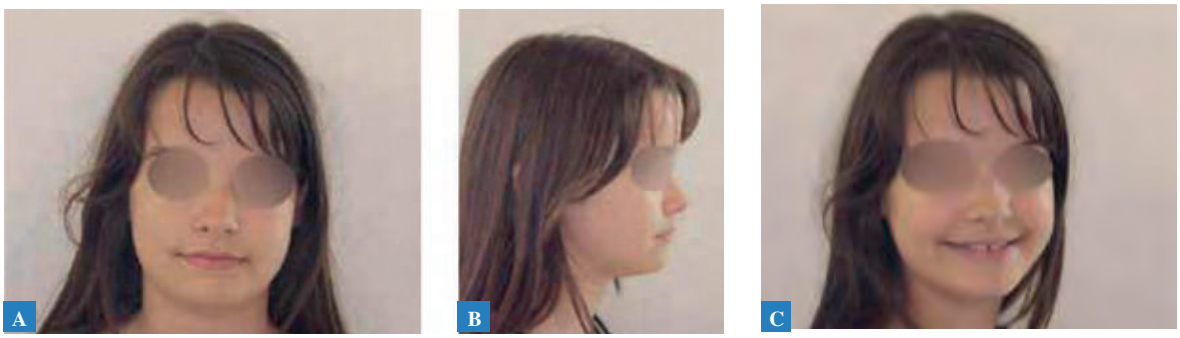
Discussion

The superimpositions show marked growth of the jaw, while the mandible is maintained. The forward tilting of the anterior pillars of the face around the fronto-maxillary suture led to anteriorization of the premaxilla.

His face is harmonized, the improvement is in all the middle area of the face: his lips are on the same vertical plane and have a balanced relief. The cervico-chin angle is more marked with the disappearance of the double chin corresponding to an ascent of the lingual body, the back of the tongue is now at the palate, and the elevation of the hyoid bone is visible on the teleradiography.

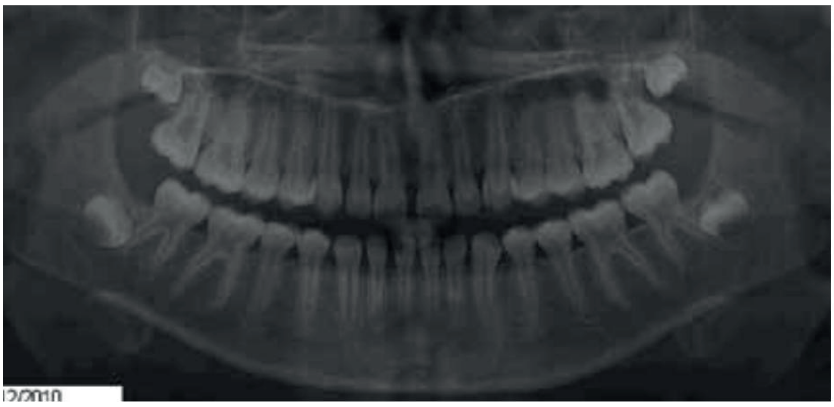
The patient smiles with the maxillary incisors (Fig.11 to 14). The examination of her face, the occlusion and her radio-graphies 5 years after the end of the treatment, before achieving the multi-joint finishing, the acquired results were maintained.

The multi-attachment treatment closed the diastemas and restored canine occlusion (Fig.15-16).



▶ **Fig. 11A to C.**

▶ **Fig. 12A to C.**



▲ **Fig. 13.**

▲ **Fig. 14.**

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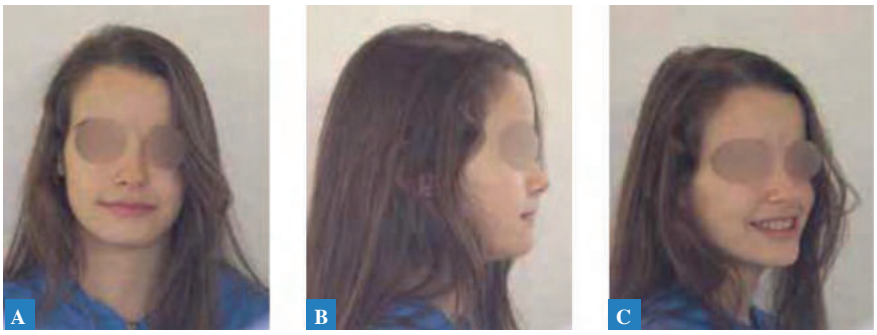


▲ **Fig. 15A to C.**

▲ **Fig. 16A to C.**

Clinical case n ° 2 (Fig.17 to26)

A 6-years and 7-month year old girl girl old consulted for mandibular prognathia.

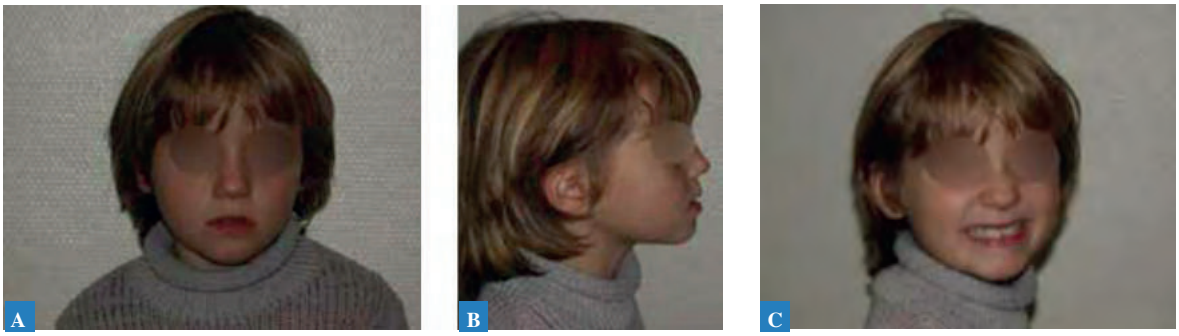
The examination of her face shows an insufficiency of the middle area of the face with a maxillary-malar relief which is too weak if not at the level of the Bichat ball.

Her eyes are surrounded, her lower lip has much less relief than the upper one.

Her smile as in all these cases shows her lower incisors and gives a smirking appearance.

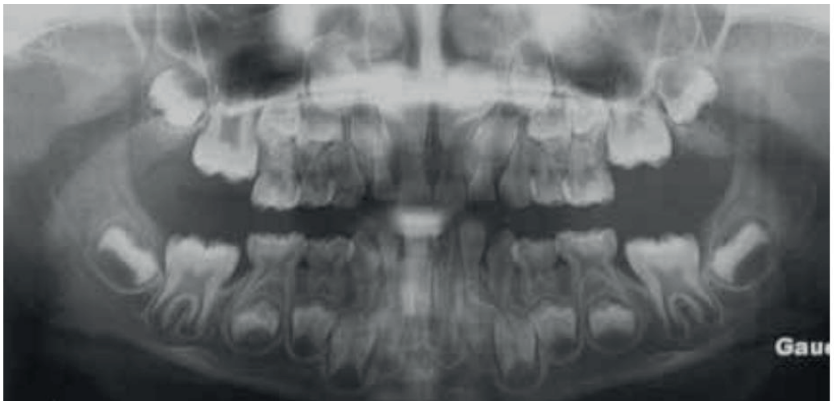
The profile picture always masks the deformation with respect to the profile teleradiography because the patients are not in occlusion, but at rest with the interposition of the tongue.

On the panoramic we see that all the teeth are present in the 2 arches except the wisdom teeth.

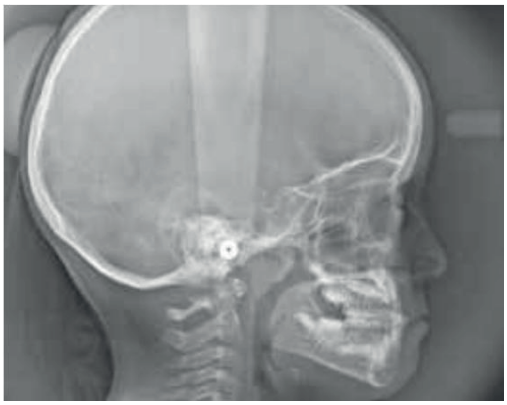


▲ **Fig. 17A to C.**

▲ **Fig. 18A to C.**



▲ **Fig. 19.**



▲ **Fig. 20.**

There is a lack of room for the definitive teeth, more marked at the superior arch, with intra-osseous rotation of the central incisors.

Profile teleradiography highlights the class III mesodivergent.

Given that we are following growing children, that no bone has reached its final size, we choose to take over the late structure that is here the maxillary, to increase its growth.

The treatment is started with a molar elevation, which must remain in place when the central milk incisors fall out in order to wait for the breakthrough of 11 and 21. The presence of the incisors is essential to form a blockage for the mandible.

This is why an important recovery even reversed is a very favorable prognosis.

As soon as the incisors of the brackets breakthrough, they will correct their mesio-palatal rotation, which gave an unfavorable interference.

▲ **Fig. 21A to L.**

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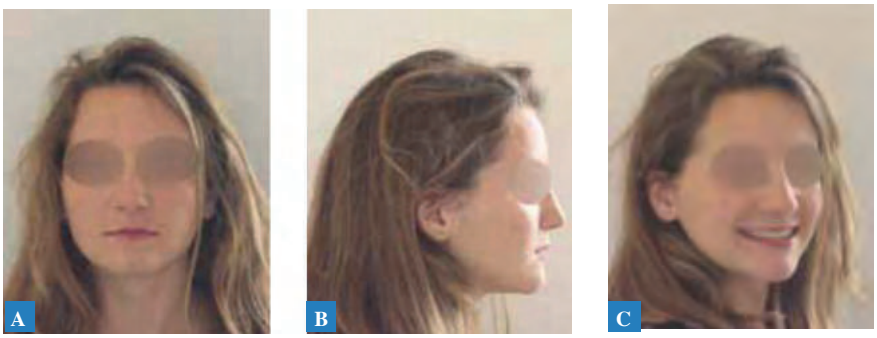
▲ **Fig. 22A to C.**

The patient is reviewed in definitive dentition for a multi-fastener finish that will improve dental alignment.

Here is the patient at the age of 14 at the end of multi-attachment treatment with her x-rays, her face and her profile are harmonious, she smiles while showing her maxillary incisors.



▲ **Fig. 23A to C.**

▲ **Fig. 24A to C.**

▲ **Fig. 25.**

▲ **Fig. 26.**

Clinical case n ° 3 (Fig.27 to 36)

This 8-year-old, 8-month-old patient presents a class III with maxillary insufficiency and mandibular prognathia. The nasolabial angle is very open and the patient refuses to smile.

They have an inverted incisal articulate and an incisive overlay, the lower incisal center is deviated forwards and to the left.

The 12 has no room for eruption, but the lower incisors have diastems.

The panoramic confirms the lack of space in the maxilla. In all these cases, the dental obstruction especially affects the upper arch, and testifies to the hypoplasia; with the resumption of growth of this arch, the lack of space will be spontaneous. Monomaxillary extractions should be avoided, they would only aggravate the skeletal deficit with an alveolar deficit.

Teleradiography shows the large mandibular size and the maxillary retraction, whose anteroposterior growth is blocked.

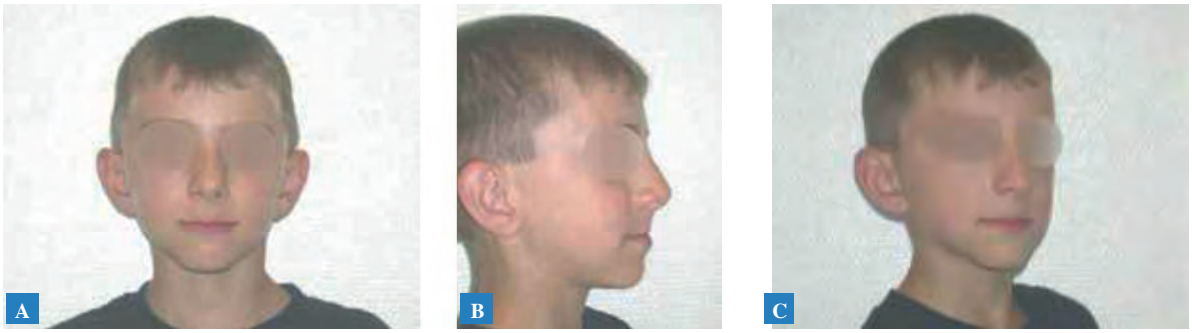
The treatment started with a molar booster, activations of the medial ram stimulate the maxillary, allowing transverse and anteroposterior homothetic growth.

Maxillary growth creates room for all incisors (Fig. 31A-C).

The mandibular incisors are retracted, thanks to the lower attachments (Fig. 32A to C).

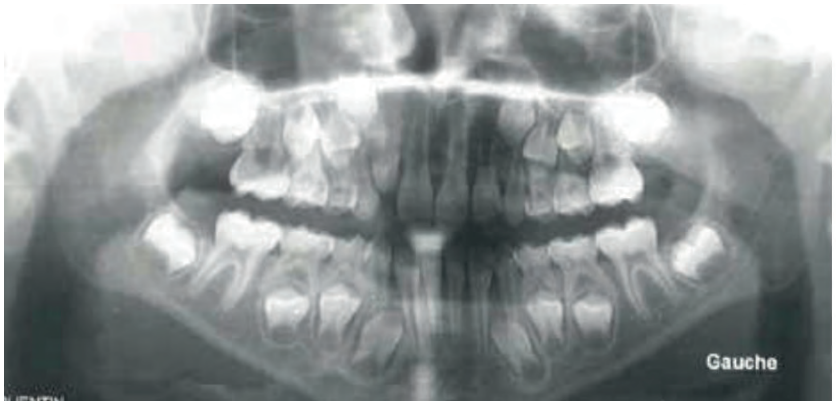
Fasteners on the maxillary incisors allow their alignment (Fig.33A to C).

At the same time as the restoration of the incisive occlusion, the relief of the middle area of the face changed. The upper lip regains a harmonic volume, the naso-labial angle closes and the cheekbones begin to emerge, nothing in his face suggests the old class III (Figs 34A to C).

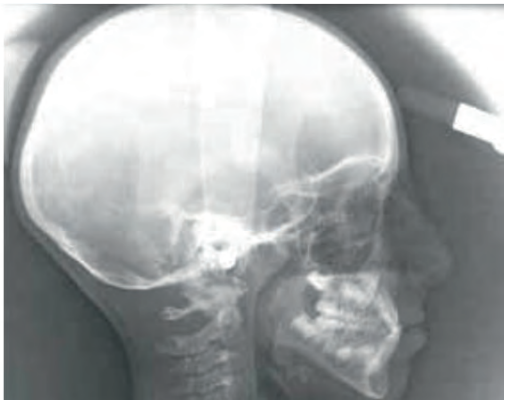


▲**Fig. 27A to C.**

▲**Fig. 28A to C.**



▲**Fig. 29.**



▲**Fig. 30.**

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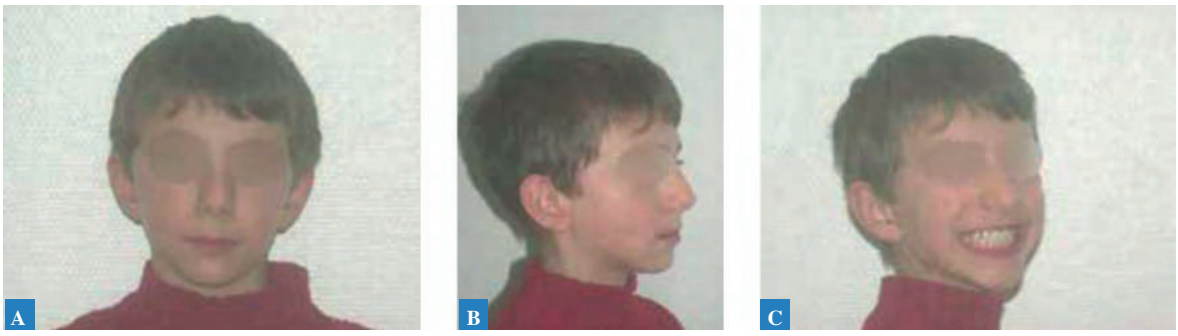
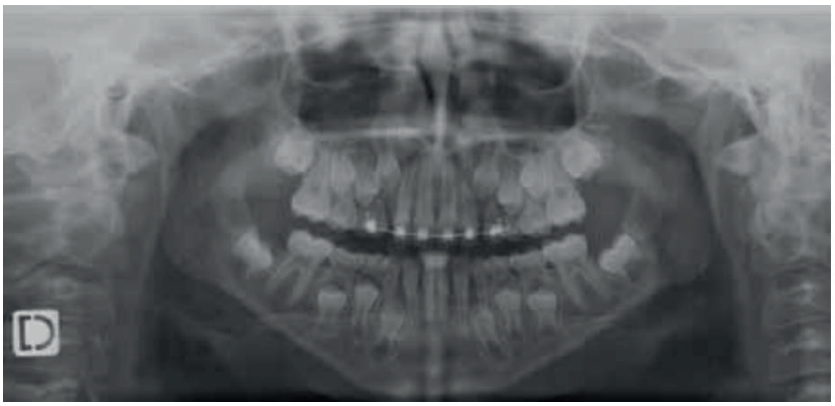
▲ **Fig. 31A to C.**

▲ **Fig. 32A to C.**

▲ **Fig. 33A to C.**



▲ **Fig. 34A to C.**



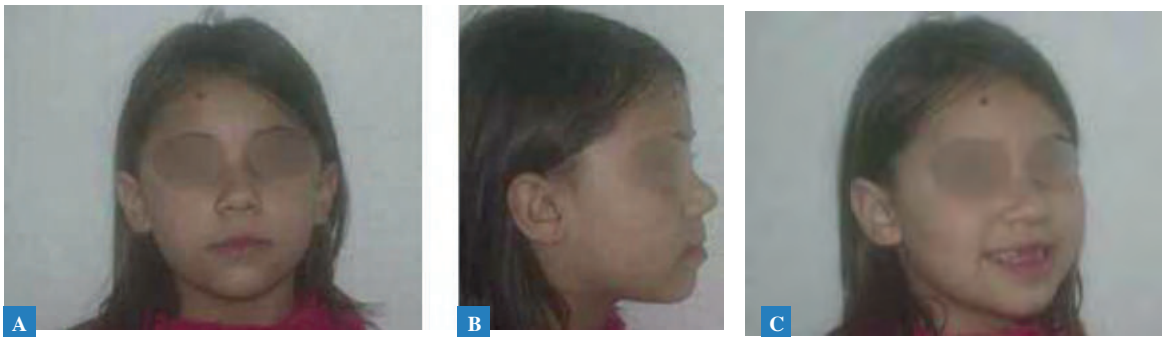
▲ **Fig. 35.**

▲ **Fig. 36.**

Clinical case n ° 4 (Fig.37 to 44)

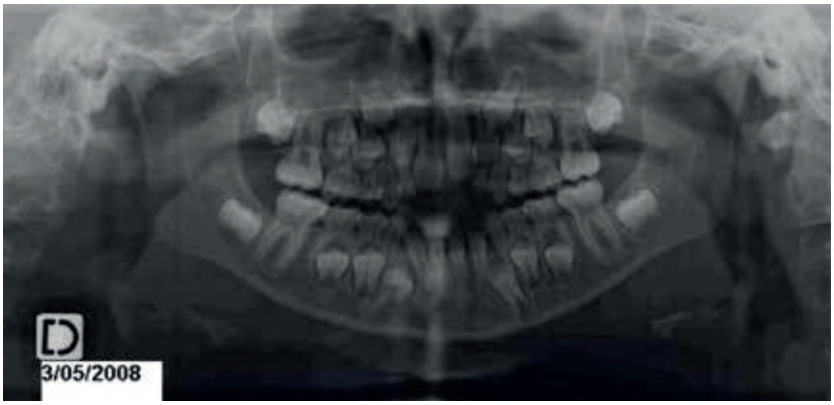
Even without managing the mandibular teeth, the elevation alone promotes the anterior vertical growth of the maxillae and closes the occlusion [12].

In the case below we obtain a closure of the open bite without any additional equipment to the lower arch.

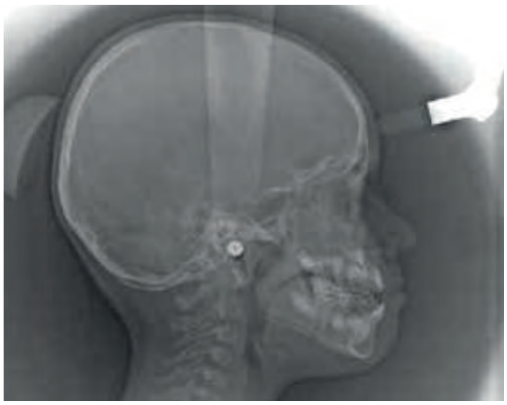


▲ **Fig. 37A to C.**

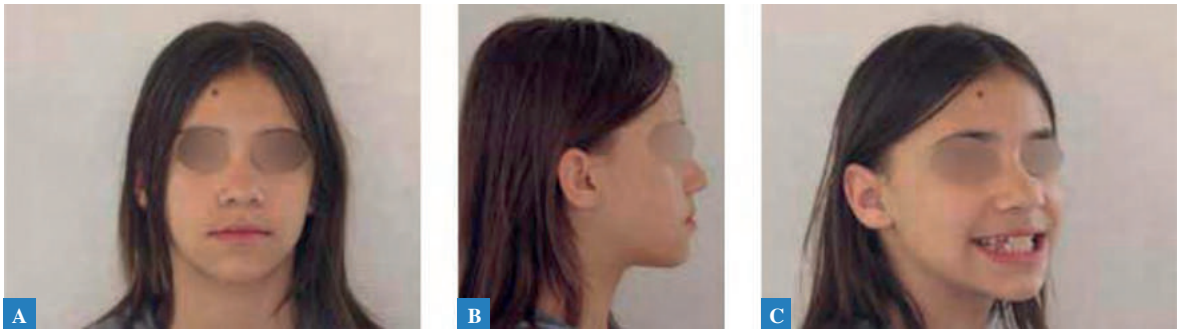
▲ **Fig. 38A to C.**



▲ **Fig. 39.**

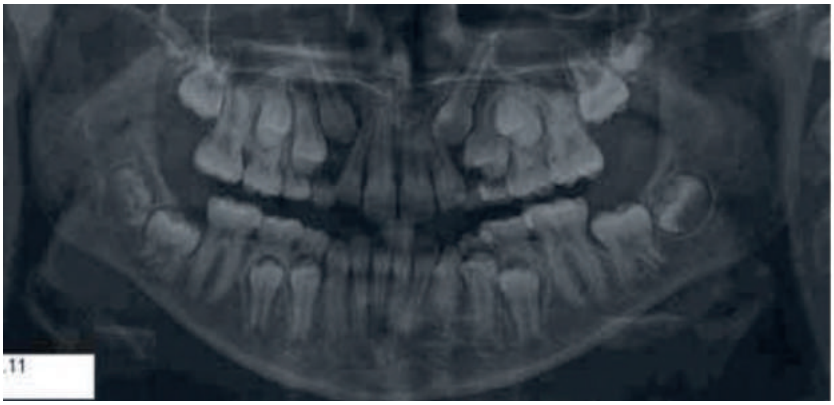


▲ **Fig. 40.**

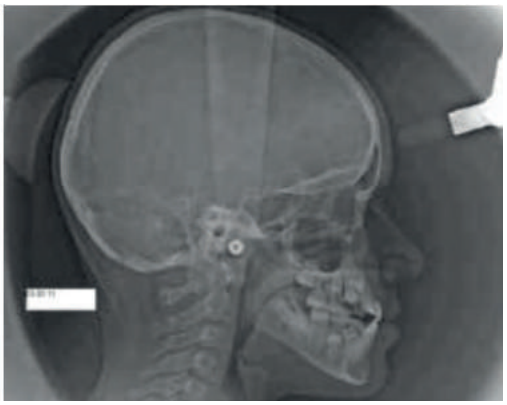


▶ **Fig. 41A to C.**

▶ **Fig. 42A to C.**



▲ **Fig. 43.**



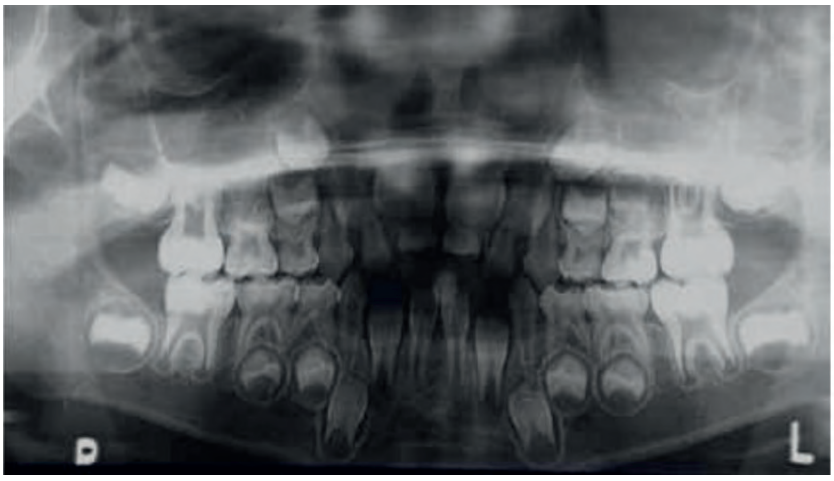
▲ **Fig. 44.**

Clinical case 5 (Figs 45 to 55)

Hyperdivergent facial patterns are the most difficult to control and stabilize because functional difficulties are often present: deficient nasal breathing, difficult to control because of the lack of spring, poor lingual posture, persistent primary swallowing, the tongue lingual interposition with phonation ... In these cases, obtaining an incisive recovery is essential to the sustainability of the results.

The tilting movement of the mandibular arch to help close the open bite is in the direction of class III compensation, but the movement induced by the molar plane device at the maxillary arch is clockwise, contrary to compensations, it has a truly orthopedic action. Canine relationships are increasing in class III as incisal contact is established.

▲ **Fig. 45A to C.**



▲ **Fig. 46.**

▲ **Fig. 47.**

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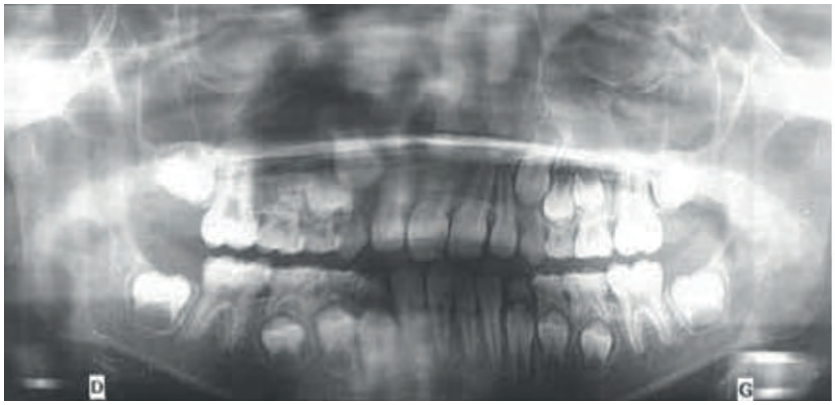
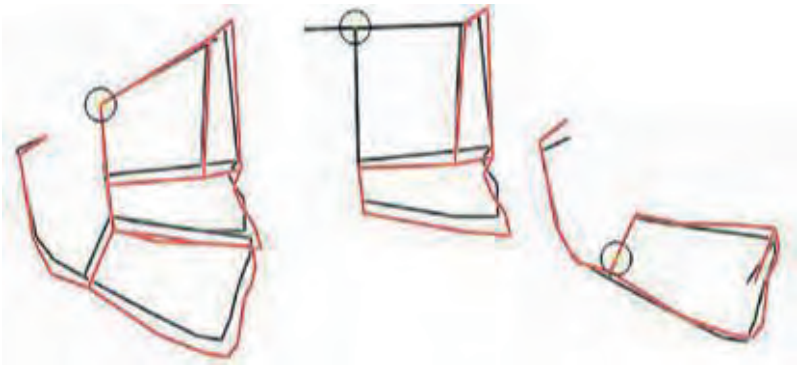
▲ **Fig. 48A to F.**



▲ **Fig. 49.**

▲ **Fig. 50.**



▲ **Fig. 51.**

The study of the superimpositions confirms that we have had a descent and an advance of the maxillary, testifying to the vertical and anteroposterior growth of the middle area of the face, while we have a previous rotation of the mandible, for a facial diagram of initial hyperdivergent, in posterior rotation.

After several years of interruption, the patient is banded in the mandibular arch only to use the E-space and move back the anterior teeth.

▶ **Fig. 52A to C.**

▲ **Fig. 53.**

▲ **Fig. 54.**

4 years after the removal, a criss/cross elastic will give the 15 which appeared late on the panning and with delayed maturation, will cause an extremely late rash in the palatal position.

▲ **Fig. 55A to C.**

Clinical case n ° 6 (Fig.56 to63)

It is better, simpler and faster to treat children before puberty, but when they come late, treatment is feasible.

Here is a girl of 12 years 9 months, settled for a year.

◀ **Fig. 56A to C.**

▲ **Fig. 57.**

▲ **Fig. 58.**

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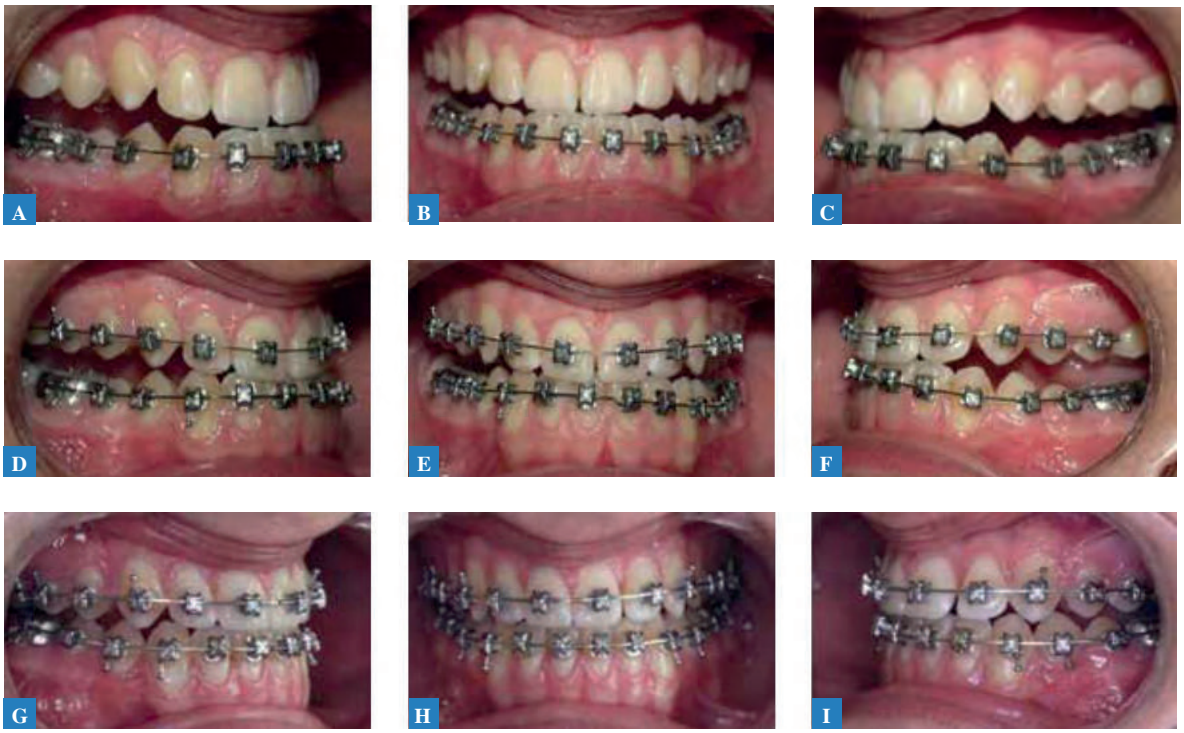
We first set up an elevation, then paired to the mandibular arch, in order to use a directional force to hold the lower teeth, mini-screws could also be used. The maxillary is banded when the correct incisal overhang is obtained.

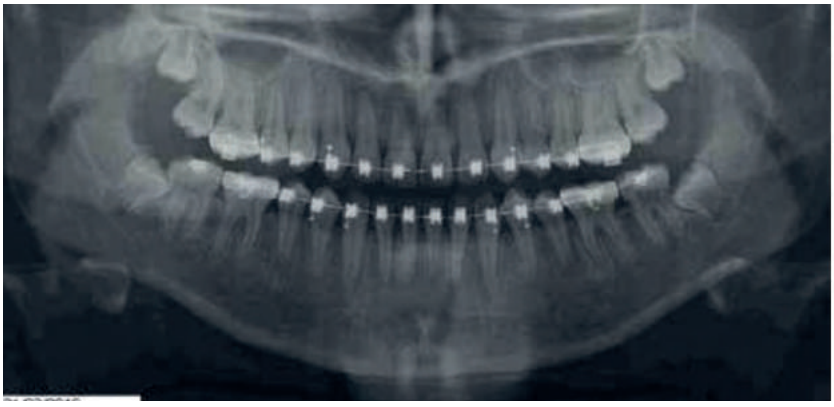
The anterior teeth are equipped with hyper-torqued brackets at the lower arch and hypo-torqued at the arch.

Rectangular threads should only be used once the incisal covering is sufficient, so that the occlusion maintains the crowns to obtain the displacement of the roots. The positive torque on the mandibular incisors allows to dig the labio-mental groove.



▲ **Fig. 59A to I.**

▲ **Fig. 60A to C.**



▲ **Fig. 61.**

▲ **Fig. 62.**

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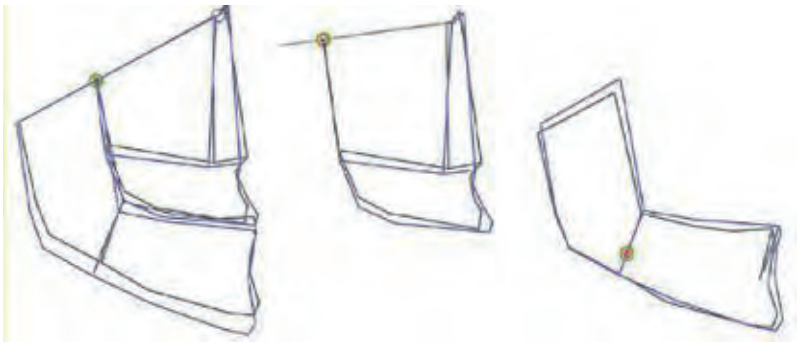
Overlays obtained with an X-ray performed during treatment show growth obtained in the maxilla.



▲ **Fig. 63.**

THE CONTENTION

Speech therapy is an excellent means of restraint by curbing dyspostures and lingual dysfunctions. But the device itself is a system of reeducation of the functions: by widening the palate the base of the nasal fossae is widened and breathing improves. At the end of the treatment, there was an elevation of the hyoid bone signifying the ascension of the lingual base.

Osteopathy limits blockages and encourages the mobility of bone structures, which is consistent with our treatments.

Among the different restraint systems we used: the night-time class III activator with an Eschler band starting from the maxillary plate to cover the mandibular incisors, the elongation of the maxillary incisors to the composite, which is the equivalent of the fixed Eschler spring and this increases the incisal recovery obtained, the maintenance of the lower incisors, especially the increase in the vertical dimension of occlusion which may or may not be associated with the previous systems.

A raised composite glued on the last teeth in the mouth will maintain non-binding results acquired. The lacteal teeth can be reconstituted in composite to increase their height. When we have the chance to treat children early, the simplest contention is the raising of the composite of the second milk molars at the level of the contact 55-85 and 65-75, allowing to increase the breakthrough of the 6 and to steadily increase the DVO, this compression will be eliminated as the milk teeth fall out and if it is made in color composite, can be observed when it does so.

In cases of dilatation of molars, common in HMIs, reconstruction by pedodontic caps will strongly consolidate maxillary advancement.

CONCLUSION

The three senses of space are interdependent, acting on the vertical direction and the transverse direction, we act on the anteroposterior sense, and vice versa. The study of these cases of mandibular prognathia and maxillary hypoplasia treated by molar elevation associated or not with other orthodontic systems, gives satisfactory results. The removable and simple device replaces the very bulky face masks and avoids mutilating surgical procedures. It allows early management, the consequences of which go beyond the scope of occlusion and dental function. From an early age, we have an overall improvement in facial aesthetics that has a positive impact on the psychology and self-image of the little patient. But increasing the vertical dimension of occlusion also gives the possibility of later treatments.

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Bibliography

[1] **Miyajima K, McNamara JA Jr, Sana M, Murata S. An estimation of craniofacial growth in the untreated Class I female with anterior crossbite**. *Am J Orthod Dentofacial Orthop* 1997; 112(4): 425-34.

[2] **Deffez JP. Prognathies mandibulaires. Propositions thérapeutiques.** *Julien Prélat* édit, Paris, 1971.

[3] **Deffez JP. Bases de l'étage moyen de la face. Les sites et les facteurs de croissance du maxillaire : données actuelles.** *Actual Odonto-Stomatol* 1979; 128: 647-68.

[4] **Deffez JP, Fellus P, Franchi-Deffez I, Huard JL. Approche comportementale des troubles de l'articulé dentaire**. *Rev Int Pédiatr* 1987; 174: 5-20.

[5] **Lepoivre M, Garlopeau F, Laudenbach P. Prognathisme mandibulaire traité par surélévation temporaire de l'articulé**. *Actual Odonto-Stomatol* 1959; 47: 577-290.

[6] **Fellus P. Orthodontie précoce en denture temporaire**. *Cah Proth* édit, Paris, 2003.

[7] **Couly G. La langue, appareil naturel d'orthopédie dento-faciale pour le meilleur et pour le pire**. *Rev Orthop Dento-Faciale* 1989; 23: 9-17.

[8] **Ben Younes-Uzan C. Proposition non conventionnelle de traitement des classes III**. *Orthodont Française* 2007; vol 82(2):133-9.

[9] **Delaire J. Architectonique et dynamique cranio-faciale. Cours d'enseignement post-universitaire de stomatologie pédiatrique.** *Hôpital Robert Debré*, 1992-1993.

[10] **Delaire J, Verdon P, Salagnac JM, Felpetto Y, Zayat S. Bases physiologiques de l'équilibre du maxillaire supérieur. Incidences en ce qui concerne le mode d'action des forces lourdes extra-orales.** *Actual. Odonto-Stomatol* 1979; 128: 611-645.

[11] **Planas P. La réhabilitation neuro-occlusale**. *Masson* édit, Paris, 1992.

[12] **Ben Younes-Uzan C. Fermeture des infraclusions par mastication sur les dents postérieures**. *Rev. Orthop. Dento-Faciale* 2017; 51: 447-455.

  I AOS 2018 I https://doi.org/10.1051/aos/2018016