Functional treatment of maxillary hypoplasia and mandibular prognathia

summary

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Description

Introduction

The lack of development of the maxilla allows mandibular hyperdevelopment in the 3 spatial planes. The lack of growth is all the more recoverable and scalable, as the child is young with future growth which will consolidate the results achieved. The use of functional appliances allows the maxillary teeth to receive masticatory stimuli and the arch to develop by catching up "behind", while the mandible reposition itself.

A functional device uses the “functions”, specificities of living things, to achieve its effects. It is by definition quite inefficient on a typodont. The function that will be stimulated by the apparatus in the mouth is chewing, and the dysfunction to be hampered is sucking. The earlier the treatment in this way, the less mechanics the system requires to be effective. However, later, functional and mechanical devices may combine to exceed the therapeutic possibilities [1-3].

The maxilla, through its role of adaptive mortar, facing the pestle-force mandible, is the bone that best responds to this type of treatment. The appliance will increase the vertical dimension of occlusion to increase the growth of the maxilla and will put the teeth into function, which will be accompanied by their proprioceptive stimulation and that of the tongue. Complex mandibulo-maxillary disharmonies can thus be treated more simply.

Diagnosis and etiology

We will present 3 clinical cases of children in whom the upper jaw is hypoplastic and the uncontained mandible is in prognathy.

• The first case is that of a 5-year-old 8-month-old Caribbean girl, presenting a global cross joint of the entire arch (Fig. 1). The maxilla is insufficiently developed in the antero-posterior direction and in the transverse direction, without any lateral deviation of the mandible, the coverage is reversed but normal in quantity. It is in lacteal dentition, without any diastema, the lower teeth are poured lingually in an attempt to compensate for the offset. There is inheritance throughout the paternal family (Fig. 2).

The teleradiography shows the skeletal class III and on the panoramic radiograph there is a lack of space for the permanent teeth in the 2 arches (Fig. 3-9). 15 and 25 not very visible at this stage, have a delay of mineralization.

The treatment intended to make up for the growth retardation will give the future place to the permanent teeth.

• The second case is a child of 6 years 4 months consulting for mandibular prognathy (Fig. 10).

The mandible circumscribes the maxilla forward and to the right. As the maxilla is inscribed in the mandible on the right before any premature contact generating a deviation, the transverse shift is already visible on the front photo, in the rest position. The smile bares the lower teeth, and is like a smirk. The occlusion shows maxillary endognathy and retrognathia with right mandibular prognathy and laterognathia.

The mandibular projection is always more marked on the teleradiography which is in occlusion (Fig. 11-16), than on the photo, in the rest position, therefore in inocclusion, with a position a little further back of the mandible. On the panoramic X-ray, the lack of space is greater at the upper arch, indicating the lack of development of this structure. The three-dimensional expansion of the arch will make room for the permanent teeth.

• Case number 3 is that of an 11-year-old boy with premaxillary hypoplasia, inducing mandibular prognathy (Fig. 17).

The occlusion is reversed on all 4 incisors; the maxillary canines, having no room, will erupt into vestibular ectopia. Here again, the lack of development of the maxilla leads to

a lack of room for the permanent teeth. The second premolars are not yet on the arch (Fig. 18).

In addition to hereditary factors, the deficit of the maxilla associated with mandibular hyperdevelopment is found in cases of lower tongue. All the factors inducing a position of the tongue inscribed in the mandibular arch and not against the palate are predisposing factors: shortness of the lingual frenum, mouth breathing forcing to leave a mouth free for the passage of air, persistence of the bottle long in infancy and widespread use of the pacifier from motherhood lasting long after the eruption of milk teeth.

The bottle and teat must be stopped before starting treatment in order to break the sucking habits [10].

Treatment objective

In the case of a cross joint, mandibular growth is not controlled and the mandible may hyperdevelop transversely, downward and forward, and generating growth in mandibular prognathy.

The upper teeth in a cross joint do not receive proprioceptive stimuli from the antagonist arch and without treatment, the jaw remains in hypoplasia, the offset cannot improve spontaneously.

These malocclusions are progressive pathologies that can be diagnosed early from the lacteal dentition. No spontaneous improvement is possible, and therefore abstaining from treatment would lead to a certain aggravation and is a waste of luck.

In growing children, no structure has reached its final size, the jaw to be taken care of is the one "late" in development, so here the upper arch.

The treatment of the jawbone will help to contain and reposition the mandible to control and reorientate its growth, thus avoiding the installation of a skeletal anomaly with deformation of the face.

The objective is to obtain a positive overhang in the 3 directions of space.

The presence of the 1st molar is not necessary to start treatment [8,10]. The final teeth are still preserved despite the apparent lack of space due to the lack of skeletal development. Each dental organ: tooth-alveolar bone-ligament, participates in the development of the bone structure: skeletal base + alveolar bone, mono-maxillary extractions would aggravate the skeletal deficit by an alveolar deficit.

Treatment alternatives

In general, this type of dysmorphosis, if caught in children, is treated with a face mask associated with maxillary disjunction, and by surgery in adults.

Treatment progression

• For the first case, on the maxillary arch we placed a device comprising molar elevations and expansion cylinders (Fig. 4). The posterior elevations are the key to the treatment, they cover the palatal and occlusal surfaces of the teeth located behind the canines.

Their effective height in classes III, to obtain a maxillary advance is such that the mandible is sufficiently lowered, therefore moved back to simulate normal inter-incisor relationships in the antero-posterior direction; the further the mandible is advanced, the greater their height must be so that the lower incisors are recessed at occlusion [5].

The device must be worn at all times, with the exception of cleaning, which will completely lose pathological proprioception and acquire a new one.

Wearing during meals is therefore essential, 1 to 2 days of adaptation to chewing are necessary, during which a simpler diet is recommended.

In addition to the elevations, the device is equipped with a median cylinder acting transversely and either an anterior cylinder for the 4 incisors, or a retro-incisal omega arch maintaining an essential anterior support against these teeth.

The molars of milk being embedded in the resin, their transverse displacement and that of their dental organ is made in a homothetic gression, without parasitic effect, and the inter-maxillary suture is also stressed.

This expansion gives the necessary space for the permanent teeth.

Thanks to the resin positioned between and against the upper teeth, the stimuli of mandibular chewing movements will be transmitted to all the teeth, including those that were not functional because they were in cross-joint.

Since there is no more interference, chewing can be alternated right and left. Anterior brackets align and tighten the incisors.

A mandibular plate, allowing for a little expansion, will move the incisors back to obtain positive overhang.

When the central incisor overlap is obtained, the wedges are gradually ground and then the plate is removed (Fig. 5).

In order to maintain the acquired result, as a temporary restraint, the last milk molars are raised, and 11 and 21 are lengthened.

The patient is seen again in permanent dentition to finish the treatment (Fig. 6), it is observed that the antero-posterior direction is better maintained than the transverse direction, the right side is in reverse articulated from 15 to 12.

The treatment is finished with passive self-ligating multi-attachments (Fig. 7).

• Treatment of the second case began with a large molar plane appliance for transverse and anterior expansion of the maxilla. Thanks to this raised occlusion, the maxillary overhang is obtained, a class III rubber band is put on the left to help recentering.

When the upper teeth cover the lower ones (Fig. 12), the height of the wedges is gradually reduced so as not to leave a lateral gap. The maxillary central incisors are brought together to make room for the laterals, and the mandibular brackets improve the coverage and position of the lower incisors. In the photo, the wedges have already been reduced (Fig. 12) by more than half of their effective starting height.

The bands and the device are removed 3 months later (Fig. 13), in June, for the summer vacation, then the patient is seen again at the start of the school year in September (Fig. 14).

• The third patient is fitted with a molar elevation plate and anterior and transverse expansion cylinders (Fig. 17). A lingual arch allows the E-space to be retained by maintaining 36 46, and will allow the spontaneous retreat of the antero-inferior teeth.

Photos (Fig. 18) are taken at the same session, when incisal coverage is obtained, with and without apparatus. The molar planes are reduced to obtain a height corresponding at least to the molar open bite so as not to have propulsion when closing. Bringing the incisors together frees room for the canines (Fig. 19). The appliance is gradually removed along with the lingual arch, and alignment is completed with brackets glued to all teeth (Fig. 20).

Discussion

Likewise, a loss of the vertical dimension of occlusion by posterior bilateral edentation generates class III intermaxillary relationships (as is often the case in the old man, who however no longer has growth); in the growing child, the increase in the vertical dimension of occlusion, by placing an elevation on the posterior teeth, will make it possible to slow down the mandibular advance and will promote maxillary growth, it is the principle used here [1,5,6].

The increase in the occlusion height will be achieved using a removable plate with molar elevations that can be used in children from lacteal dentition [10, 8].

With the eruption of permanent teeth, all other systems of conventional mechanical orthodontics can be added.

The interposition of flat resin surfaces between the molars on a plate in contact with all the maxillary teeth, allows all the upper teeth to receive the stimuli of chewing.

The response to stimuli will be done according to the laws of development of Planas [11]: the solicitation of a tooth from a maxillary or mandibular embryological bud results in a growth response from all the teeth of this bud; thus the teeth of the 3 maxillary embryological buds and the 2 mandibular embryological buds can respond.

The action of the device is expressed in the 3 planes of space, the regular activation is done thanks to the jacks.

The very large height of the planes changes the orientation of the chewing forces [5]: from vertical, they become oblique with a postero-anterior component that pushes the maxilla forward, as the face mask pulls it.

The resin being in contact with the lingual surface of the upper incisors, the functional stresses of bite impact (Delaire) [9] and masticatory friction (Planas) [11] are transmitted to these teeth and provide the energy to generate the expansion of this arch which is supported by jacks.

The earlier the expansion in the 3 directions of space, the less facial sequelae. Delaire explained the role of the forces of occlusion, crucial at the time of the eruption of the teeth which “empty” the jawbone and participate in the development of the sinuses; giving an external exo-face structure and an internal endo-face structure.

As chewing pushes the exoface outward, the internal sutures pull the endo-face inward; this dynamic actively participates in the pneumatization of the face and in the construction of its volume.

Ligaments and muscles, in particular the lateral pterygoid, have their orientation altered by the advancement and descent of the condyle into the glenoid cavity. Their axis is transformed, initially horizontal, it becomes oblique; and by becoming vertical, the muscles then lose part of their propulsive action which acted on the mandible [5].

The generally very powerful tongue in these patients can exert its centrifugal action on the upper incisors, which are no longer retained by the occlusion. The resin side wedges will increase the volume available inside the dental arches, which will be pushed by them [6].

As their thickness is greater than the free space of occlusion, lateral lingual interposition between the arches is prevented and dental proprioception is stimulated as the posterior teeth regain contact through the molar planes.

The lower orbicularis will no longer put stress on the released upper incisors, but rather on the mandibular teeth.

The less toned upper orbicularis, will offer less resistance to lingual pressure on the maxillary incisors.

The device also has an anti-dysfunctional role because there is a real antagonism between the tongue and the teeth [4].

In the newborn, the tongue is spread between the alveolar processes; to feed the baby head and swallow by sucking and swallowing. As the teeth erupt, then their chewing rubs, the tongue will move back "so as not to be eaten", unless the child persists in the habits of sucking, or of habitual mouth breathing maintaining the mouth. tongue in the

down position, then the teeth will stay away. Everything in the mouth is bitten except the tongue (in the absence of anesthesia) which is covered with proprioceptive and nociceptive receptors.

Faced with this antagonism, 2 therapeutic attitudes exist: either to push back the tongue, these are all the techniques of re-education and lingual repositioning [7], or to make the teeth work and ensure that the movements of laterality in friction, masticatory stimuli , are transmitted to all teeth, even those with malocclusion.

When the tongue no longer spreads out between the arches, it can position itself on the palate, which promotes nasal breathing at the same time as the maxillary expansion, because the nose is the roof of the mouth and the enlargement of the palate generates necessarily better nasal permeability [6].

The perfectly adapted palatal resin also makes it possible to restore proprioception to the back of the tongue which can regain a high position, without undergoing pathological support and the resin intrados will be ground as the expansion progresses to restore the palate. a shape adapted to the lingual dome.

The device allows a transverse action on the lateral crossbones as well, because the resin interposed between the teeth will free the upper teeth from the pathological occlusion which opposed any development of the arch. Chewing then becomes possible alternately on both sides. The molar elevation can also help to close the vertical direction [2] by intruding the posterior sectors covered with resin and allowing spontaneous erosion of the anterior teeth to express itself.

Results of treatment

In the 1st case, by observing the lateral teleradiographs, we note that although the upper central incisors are proalveolate at the end of the first phase of treatment (Fig. 8), as the normalized occlusion is obtained early (at the time of incisor eruption), growth spontaneously improves their inclination by straightening the roots (Fig. 9).

Obtaining a functional occlusion early allows growth to continue to improve results.

For the second case, we note that thanks to the treatment, the face has regained harmony and symmetry.

After treatment, the patient no longer smiles with the lower teeth, but with the upper incisors (Fig. 13).

The elevation plate allowed the correct repositioning of the maxilla over the mandible, and previously bonded clips aligned the teeth. The lack of room for the permanent teeth spontaneously improved (Fig. 14).

The patient is seen again in final dentition at 12 years 9 months (Fig. 15) with a radiological assessment (Fig. 16), to undertake a multi-attachment finish, the orthopedic results obtained early have been maintained.

The third case, undertaken later, shows that the functional apparatus allowed a resumption of growth in the anterior zone of the jawbone. The clips are placed as soon as positive overlap is obtained and the height of the planes is reduced (Fig. 18).

The patient is seen again at 22 years 8 months (Fig. 21-23), at the practitioner's request, with a radiological assessment (Fig. 24).

The wisdom teeth were extracted, the results are generally maintained with the exception of the articulated 23/33, no retention wire was glued at the time to prevent periodontal problems on the incisors in the event of recurrence possible (Fig. 25-26).

We note, however, that the maxilla and the middle level of the face lack relief and volume, compared to the cases undertaken earlier, in which, in adulthood, no sequel to the initial malocclusion is detectable on the face. The use of a lingual arch to block the 6s in the treatment of Class III may be responsible for the secondary mesialization of these teeth and the subsequent lack of space for the lower canines.

Conclusions

The assistive devices can promote the growth of the maxilla in the 3 planes of space, by modifying the vertical dimension of occlusion and by allowing the mandible freedom of movement. Their use can be early from the lacteal dentition, but they can be combined with all conventional orthodontic devices to potentiate their effects. The increased growth of the maxilla gives way to the permanent teeth, allows a favorable reorientation of the mandibular growth resulting in the simple resolution of very complex cases.

The results are much better when the subject is young, before the eruption of the maxillary lateral teeth.