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CASE SERIES

Combined therapy in the treatment of hyperdivergence in growing patients: Case series

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ABSTRACT

Background: Dento-skeletal disorders are a group of conditions that directly affect the maxillomandibular complex and the relationship between the dental arches. Among these alterations, long face syndrome or facial hyperdivergence syndrome is a dentofacial disorder of great clinical interest. Its etiology is multifactorial and involves the interaction of genetic and environmental factors during the growth period.
Objective: To review a series of clinical cases on the effectiveness of the Simoes Network 3 (SN3) functional appliance, combined with lingual educators, in the management of anterior open bite in pediatric patients with a hyperdivergent growth pattern. Two clinical cases treated with this appliance are also presented.
Conclusion: Anterior open bite (AOB) is a malocclusion associated with hyperdivergence syndrome related to a hyperdivergent growth pattern and deleterious oral habits. Functional orthodontics (FO) offers effective therapeutic options during the growth stage, aimed at modifying altered muscle functions and skeletal patterns.

CLINICAL RELEVANCE

Malocclusions in pediatric patients must be treated once detected in order to redirect the growth of the craniofacial complex. Hyperdivergence is an occlusal disorder that poses great difficulties in its treatment. This article presents a detailed approach to its etiology and provides professionals with an interdisciplinary therapeutic approach that is extremely useful for their clinical practice.

INTRODUCTION

Dento-skeletal disorders are a set of conditions that directly impact the maxillomandibular complex and the relationship between the dental arches. Among these conditions, long face syndrome emerges as a subset of disorders of particular interest. [1] This syndrome, also known as facial hyperdivergence syndrome, is the result of the interaction of different etiological factors during the growth period.2 It has been associated with genetic and environmental factors such as nasal obstruction, parafunctional habits, hypertrophic adenoids, macroglossia, atypical swallowing, and masticatory muscle weakness.[3]

Elongated facial morphology is usually associated with a series of classic characteristics, including an enlarged lower third of the face, retrognathism, depressed nasolabial areas, excessive exposure of the upper teeth, lip incompetence, narrow palate, posterior crossbites, anterior open bite, dolichofacial pattern, and prominent chin. [4]

The hyperdivergent pattern results from a combination of dentoalveolar and skeletal characteristics. Therefore, various cephalometric variables representing these areas have been associated with elongated facial morphology, including reduced posterior facial height, increased total facial height, increased anteroinferior facial height, and increased gonial angle and mandibular plane angle. [5–7]

MAA is a common clinical feature in patients with a hyperdivergent pattern. It is considered an alteration in the vertical relationship of the dental arches in which there is a lack of contact between the incisal edges of the upper and lower incisors and the posterior teeth are in contact. [8]

MAA is classified as dentoalveolar or skeletal; the dentoalveolar type is caused by a change in the growth of the alveolar component due to the lack of eruption of the anterior teeth and the excess of the posterior teeth. These patients do not have significant skeletal abnormalities and are generally related to habits or some obstacle that arises during eruption. Patients often present with diastemas in the anterior region of the maxilla, vestibularization of the upper incisors, and excessive function of the perioral muscles, which promotes transverse compression and increased maxillary length. [8–10]

Skeletal MAA is caused by an unfavorable pattern of vertical growth of the bone bases, without being compensated by an increase in the alveolar area. 8 In this type of open bite, we may find an increased gonial angle and steep mandibular plane, small mandibular body and ramus, increased anterior facial height and decreased posterior facial height, and divergent mandibular and palatal planes.[8]

The transverse dimension of the arches is reduced, and a deep palate and prognathic premaxillary segment are observed; these characteristics, together with the functional imbalance of the orbicular muscles, cause the patient to have an incompetent lip seal and an elongated face. [11–13]

Patients with anterior open bite and vertical growth patterns also have lower electromyographic activity in the muscles during maximum voluntary clenching and lower bite force compared to mesoprosopic patterns. 14,15

The presence of an anterior open bite can alter protrusive condylar trajectories, and lateral trajectories are shorter. These factors affect normal joint function, favoring the development of temporomandibular disorders and, in extreme cases, condylar erosion. 16,17

MAA is one of the malocclusions that presents the greatest difficulty for professionals when trying to achieve a satisfactory and stable result. Functional orthopedics of the jaws (FJO) allows specialists to diagnose, prevent, and treat problems in the growth and development of stomatognathic structures.

It provides different therapies that facilitate the correction of malocclusions by establishing correct function and harmony of the jaws.[20]

FJO acts on the neuromuscular system by causing stimuli that lead to adequate neural excitation of the periodontium, joints, oral mucosa, masticatory muscles, tongue, and periosteum.[21,22]

Tongue re-educators are devices used to modify tongue function and eliminate harmful habits.23 They act by selectively applying stimuli, moving the tongue away from its pathological position and guiding it towards the correct position. This is achieved through a subconscious avoidance reaction. In this way, the patient quickly becomes accustomed to adopting a different and correct tongue position both at rest and when swallowing, and this position is maintained once the appliance is removed.[23]

Dr. Wilma Simoes developed a series of appliances (Simöes Network or SN) based on the basic principles of neuro-occlusal rehabilitation. She revisited some of the considerations used in the appliances developed by Bimler, Franklel, and Planas and created specific appliances that vary according to the structures that need to be stimulated to produce the desired development. The most suitable device is chosen according to the patient's malocclusion.[19]

The Simoes Network [3] is a functional orthopedic appliance, also known as the lower flipper model. It is a bioelastic appliance composed of an interconnected series of wire and acrylic systems, whose main objective is to change the mandibular and lingual posture. It is indicated in cases of divergent occlusal plane, open bite, crossbite, and biprotrusions. [24]

The SN3 consists of a Bimler vestibular arch made of 0.9 mm wire. The front springs or handles are positioned according to the therapeutic objective: either to acquire a new tongue posture or for vestibularization and correction of rotations of the upper incisors. It is essential to leave the incisive papilla free, due to its high concentration of sensory receptors. [24]

In addition, the SN3 incorporates an expansion screw or coffin, located at the top, which is indicated to improve or stimulate upper transverse development; its activation must be exclusively passive, allowing the development achieved thanks to the action of the appliance to be maintained. The dorsal arches transmit the force of mandibular movements to the entire stomatognathic system and stimulate the masticatory, orofacial, and cervical muscles through functional proprioception.

Finally, the anterior wave bar acts as a lingual brake, keeping the tongue in a more posterior position and preventing pressure on the dentoalveolar structures (Figure 1).[24]

Figure 1. Simoes Network 3(SN3). Taken from https://www.orthorich.com/productos/simoes-network 3

In this article, we present a series of clinical cases of growing patients with a hyperdivergent pattern and anterior open bite, treated simultaneously with modified SN3 and tongue re-educators.

CASE REPORT

Case 1 DV:

Male patient, aged 3 years and 11 months, attending a pediatric dentistry appointment accompanied by his mother, who expresses concern about her son's bite.

Facial analysis reveals a dolichocephalic skull type, convex profile, enlarged lower third, thick lower lip, thin upper lip, and lip incompetence. Intraoral clinical examination reveals complete primary dentition, narrow and deep upper arch, anterior open bite, posterior crossbite, mesial step, and bilateral canine class III (Figure 2).

Figure 2. Initial clinical photographs.

Figure 3 shows the panoramic X-ray and Figure 4 shows the lateral skull X-ray.

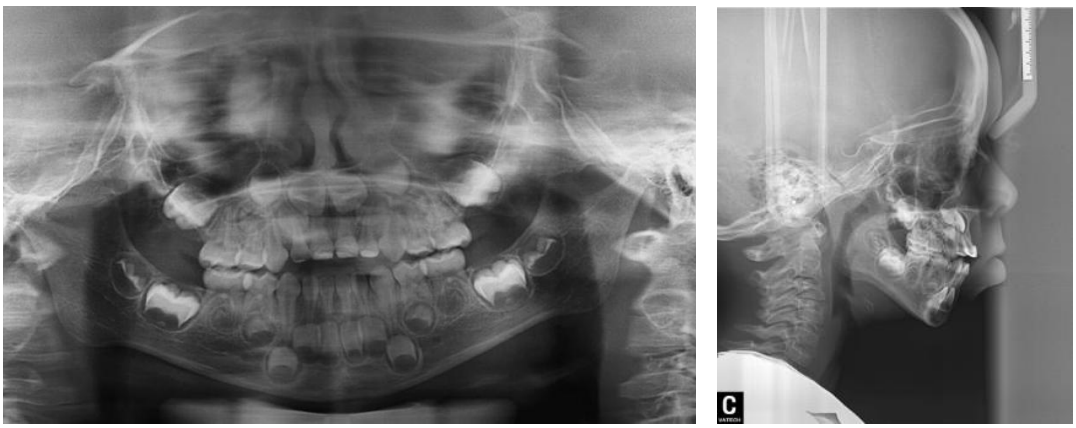

Figure 3. Initial panoramic and lateral X-ray of the skull.

The following objectives were set for the treatment plan: (i) Redirect the hyperdivergent growth pattern; (ii) Modify the occlusal plane; (iii) Correct the position of the tongue using tongue re-educators cemented to the palatal surface of the upper temporary central incisors; (iv) Transverse development of the upper arch.

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To achieve these objectives, it was decided to place a modified SN3 appliance with a coffered arch, progeny arch, and double corrugated bar (Figure 5).

Figure 5. Modified Simoes network 3, front and side view.

It was recommended that he wear the appliance both day and night, removing it for eating and sports activities. The patient was in the initial phase of treatment for two years and returned for consultation at the beginning of his dental replacement.

At the beginning of mixed dentition and at the age of seven, the patient returned to resume treatment (Figure 6).

Figure 6. Clinical photos of the patient at age 7 in early mixed dentition

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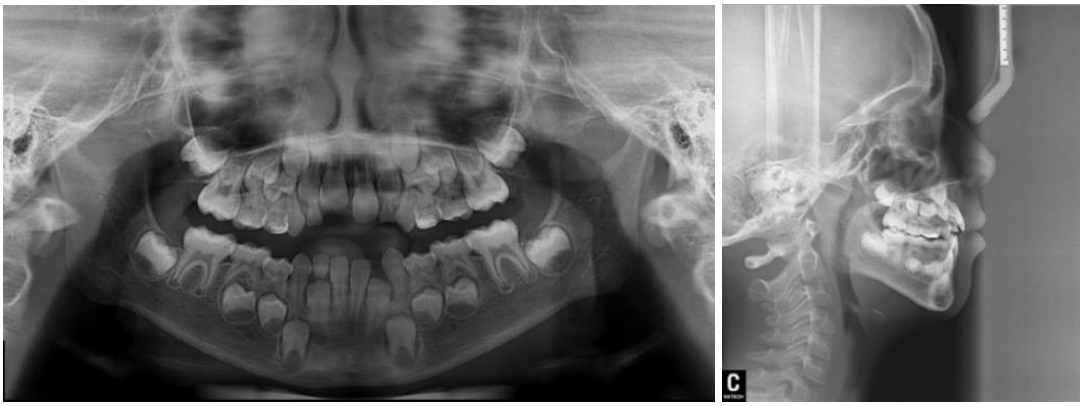

Figure 7. Current panoramic and lateral skull X-rays.

Figure 8. Current clinical photograph.

Early intervention in patients with hyperdivergent growth patterns and anterior open bites is essential to guide maxillofacial development and prevent the consolidation of more complex functional and skeletal alterations.

Currently, in the case presented, the use of the Simoes Network 3 (SN3) functional appliance, in combination with lingual educators, shows clear improvements in occlusal relationship, facial harmony, and muscle function, demonstrating the effectiveness of early treatment with this appliance. The results obtained highlight the importance of an interdisciplinary approach and continuous monitoring during the early stages of craniofacial growth in order to achieve stability and sustainable long-term functional results.

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CASE 2 AM

A 6-year-old girl attends a pediatric dentistry consultation accompanied by her mother, who expresses concern about her daughter's teeth.
The clinical examination revealed a dolichofacial skull type, convex profile, facial asymmetry with the left side more prominent than the right, enlarged lower third, lip incompetence, adenoid facial features, early mixed dentition but advanced for her age, anterior open bite, deep palate, rounded and narrow upper arch, square lower arch, low tongue position, good oral hygiene, and no caries lesions. She reports no harmful habits. (Figure 8).

Figure 8. Initial clinical photographs

No harmful oral habits were found. Figure 9 shows the panoramic and lateral skull radiographs, respectively.

Figure 9. Initial panoramic and lateral skull X-rays.

Figure 11 shows the patient with the SN3 appliance, and Figure 12 shows the patient at age 9 with late mixed dentition, where correction of the anterior open bite can be observed.

Figure 10. Current clinical photographs.

Figure 11. Current panoramic and profile X-rays.

Figura 12. Current device.

Treatment with SN3 and tongue re-educators proved effective in this case, with significant clinical improvements observed. The patient presented a notable reduction in anterior open bite, improvement in vertical facial proportions, and normalization of tongue posture and function. These results show that the combination of functional orthopedic treatment with tongue re-education not only favored the correction of malocclusion but also the re-education of orofacial functions.

DISCUSSION

The treatment of growing patients with AOM and a hyperdivergent pattern represents a clinical challenge due to the diversity of etiological factors that may be involved, including skeletal, dental, functional, and environmental variables. The treatment objectives for correcting anterior open bite are: to improve the profile, achieve anterior tooth contact, obtain an adequate vertical and transverse relationship, achieve a change in mandibular posture, and obtain an adequate tongue position and function for proper swallowing (25).

Functional orthopedic treatment with SN3, in combination with tongue educators, not only stimulated favorable vertical and transverse control but also guided muscle function toward more balanced patterns in the two cases reported.
Inadequate tongue posture interferes with respiratory function and plays an important role in the development of MAA. The appliances used allow for a change in the position of the tongue and favorably affect the growth of its area of influence (26).

In the treatment of AAM, consultation with otolaryngology and speech therapy is essential to diagnose possible airway alterations, reinforcing the concept that therapeutic success in this type of malocclusion requires an interdisciplinary approach.

CONCLUSIONS

The treatment of OFM with SN3 in combination with tongue re-educators proved to be an effective alternative in the management of anterior open bite associated with a hyperdivergent pattern in growing patients.

The interdisciplinary approach allowed not only the correction of skeletal and dental alterations, but also the modification of harmful oral habits such as thumb sucking and tongue thrusting, promoting a more harmonious development of oral functions and the airway.

The results obtained in the two clinical cases confirm that combined therapy enhances orthopedic and functional effects, offering comprehensive and stable management in pediatric patients with this malocclusion.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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The authors declare that they have no sources of funding.

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