CASE REPORT

EARLY TREATMENT OF ANTERIOR OPEN BITE WITH SIMÕES NETWORK 3 (SN3) APPLIANCE

QUARESMA, A.; LEITE, A.; ESPERANCINHA, C.

ABSTRACT

▪ Anterior open bite is considered one of the most challenging dentofacial deformities to treat and obtain stable results. The understanding of its etiological factors is essential to the establishment of a diagnosis and an appropriate treatment for the patient. This poster reports the clinical and cephalometric modifications produced in an open bite patient treated with a Simões Network 3 (SN3) orthopedic functional appliance.
KEYWORDS: Anterior Open Bite; Malocclusions; Functional appliance; Simões Network 3.

INTRODUCTION

▪ An **anterior open bite** is present when there is no contact between the upper and lower anterior teeth and no overbite (vertical overlap of the upper and lower incisors). The severity of open bite varies from an edge to edge relationship to a severe open bite with teeth contact only in the molar areas. Anterior open bite can be of dental, skeletal, functional or a combination of all three in origin[1]. The prevalence ranges from 17% to 18% of children in the mixed dentition[2, 3].

▪ Ideally, treatment of open bites should be started as early as they are diagnosed. Often, **early intervention** can eliminate the causes of the open bite especially if they are related to a persistent habit such as thumb sucking, lingual interposition or mouth breathing. Also, early intervention can re-direct jaw growth and establish a more favorable mandibular growth direction[4, 5].

▪ Different **therapeutic approaches** have been described for the treatment of anterior open bites including: orthodontics, functional orthopedics and even surgical interventions[6].
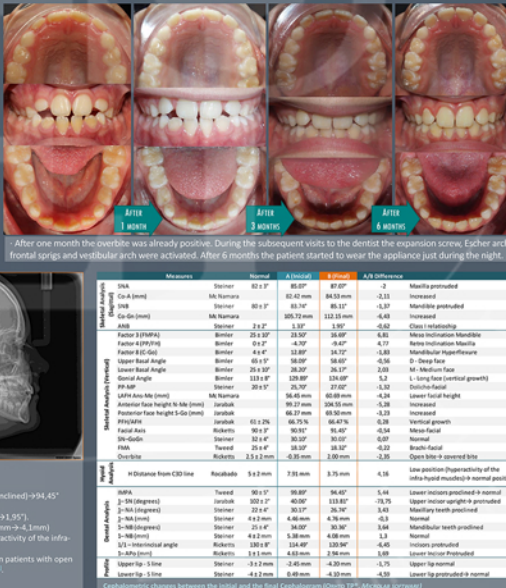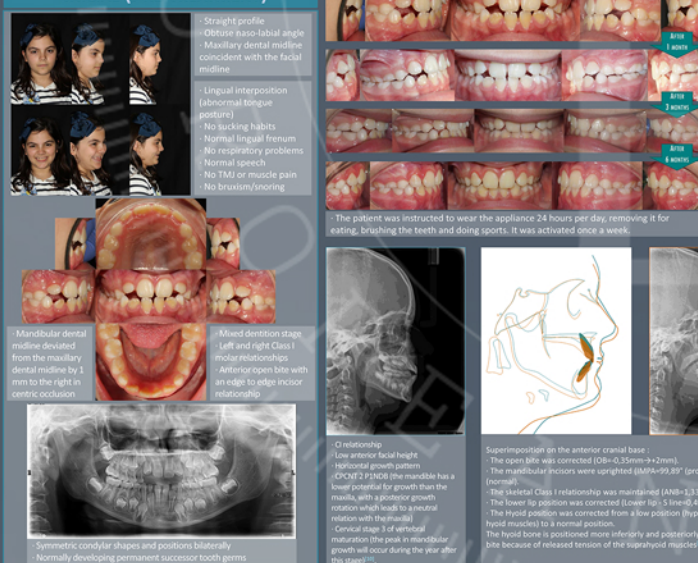
▪ One option for the early treatment of open-bite malocclusions is the **Simões Network** functional appliances. Prof. Wilma Simões developed a series of Orthopedic functional appliances (Simões Network or SN) based on the principles of neuro-occlusal rehabilitation[7]. She resumed some of the ideologies used in Bimler's, Frankel and Planas's appliances and modified some of them, creating a specific series of removable apparatus to use according to the structures that need to be stimulated. Depending on the malocclusion of the patient, the most convenient device is chosen[8].

▪ The **Simões Network 3 (SN3)**, also known as "Lower Winglets Model" is a functional appliance indicated for open bites, mesio-occlusions, tendency to class III, edge-to-edge relationships, biprotrusion and disto-occlusion. It helps the mandibular anterorotation through a change of therapeutic posture. Its action (essentially on the digastric muscle) is based on controlling the lingual and mandibular movements by anchoring the mandible and changing the relationships between the tongue and the arches[8].

Simões Network 3 com arco de Eschler

Adapted from Ramírez-Yáñez, 2014 [9]

CASE REPORT

▪ A 8-year-old female patient accompanied by her father was referred by his pediatric dentist for an orthodontic consultation regarding her anterior bite. Following clinical and radiographic examinations, the decision was made to fabricate a Simões Network 3 (SN3) appliance with an Eschler arch.

INICIAL (PRE-TREATMENT)

- Straight profile
- Obtuse naso-labial angle
- Maxillary dental midline coincident with the facial midline
- Lingual interposition (abnormal tongue posture)
- No sucking habits
- Normal lingual frenum
- No respiratory problems
- Normal speech
- No TMJ or muscle pain
- No bruxism/snoring

- Mandibular dental midline deviated from the maxillary dental midline by 1 mm to the right in centric occlusion

- Mixed dentition stage
- Left and right Class I molar relationships
- Anterior open bite with an edge to edge incisor relationship

- Symmetric condylar shapes and positions bilaterally
- Normally developing permanent successor tooth germs

AFTER 1 MONTH / AFTER 3 MONTHS / AFTER 6 MONTHS

· The patient was instructed to wear the appliance 24 hours per day, removing it for eating, brushing the teeth and doing sports. It was activated once a week.

· After one month the overbite was already positive. During the subsequent visits to the dentist the expansion screw, Eschler arch, frontal sprigs and vestibular arch were activated. After 6 months the patient started to wear the appliance just during the night.

· CI relationship
· Low anterior facial height
· Horizontal growth pattern
· CPCNF2 P1NOB (the mandible has a lower potential for growth than the maxilla, with a posterior growth rotation which leads to a neutral relation with the maxilla)
· Cervical stage 3 of vertebral maturation (the peak in mandibular growth will occur during the year after this stage)[10]

Superimposition on the anterior cranial base:
- The open bite was corrected (OB=-0.35mm→+2mm).
- The mandibular incisors were uprighted (IMPA=99,85° (pro-inclined)→94,45° (normal)
- The skeletal Class I relationship was maintained (ANB=1,33°→1,95°).
- The lower lip position was corrected (Lower lip -1,5ine=0,49mm→-4,1mm)
- The Hyoid position was corrected from a low position (hyperactivity of the infra-hyoid muscles) to a normal position.
- The hyoid bone is positioned more inferiorly and posteriorly in patients with open bite because of released tension of the suprahyoid muscles[11].

FINAL (POS-TREATMENT)

PHYSIOLOGIC PROTRUSION

PLANAS FUNCTIONAL MASTICATORY ANGLES (PFMA)

	Measures		Normal	A (Inicial)	B (Final)	A/B Difference	
Skeletal Analysis (Maxilla)	SNA	Steiner	82 ± 3°	85.07°	87.07°	-2	Maxilla protruded
	Co-A (mm)	Mc Namara		82.42 mm	84.53 mm	-2,11	Increased
	Co-Gn (mm)	Steiner	80 ± 3°	83.74°	85.11°	-1,37	Mandible protruded
	Co-Gn (mm)	Mc Namara		105.72 mm	112.15 mm	-6,43	Increased
	ANB	Steiner	2 ± 2°	1.33°	1.95°	-0,62	Class I relationship
Skeletal Analysis (Vertical)	Factor 3 (FMPA)	Bimler	25 ± 10°	23.50°	16.69°	6,81	Mesa Inclination Mandible
	Factor 4 (PP/FH)	Bimler	0 ± 2°	-4.70°	-9.47°	4,77	Retro Inclination Maxilla
	Factor 8 (C-Go)	Bimler	4 ± 4°	12.89°	14.72°	-1,83	Mandibular Hyperflexure
	Upper Basal Angle	Bimler	65 ± 5°	58.09°	58.65°	-0,56	D - Deep face
	Lower Basal Angle	Bimler	25 ± 10°	28.20°	26.17°	2,03	M - Medium face
	Gonial Angle	Bimler	113 ± 8°	129.89°	134.69°	5,2	L - Long face (vertical growth)
	PP-MP	Steiner	20 ± 5°	26.70°	27.02°	-1,32	Dolicho-facial
	LAFH Ans-Me (mm)	Mc Namara		56.45 mm	60.69 mm	-4,24	Increased
	Anterior face height N-Me (mm)	Jarabak		99.27 mm	104.55 mm	-5,28	Increased
	Posterior face height S-Go (mm)	Jarabak		66.37 mm	69.50 mm	-3,23	Increased
	PFH/AFH	Jarabak	61 ± 2%	66.75 %	66.47 %	0,28	Vertical growth
	Facial Axis	Ricketts	90 ± 3°	90.91°	91.40°	-0,54	Meso-facial
	SN-GoGn	Steiner	32 ± 4°	30.10°	30.03°	0,07	Normal
	FMA	Tweed	25 ± 4°	18.10°	18.32°	-0,22	Brachi-facial
	Overbite	Ricketts	2.5 ± 2 mm	-0.35 mm	2.00 mm	-2,35	Open bite → covered bite
Hyoid Analysis	H Distance from C3D line	Rocabado	5 ± 2 mm	7.91 mm	3.75 mm	4,16	Low position (hyperactivity of the infra hyoid muscles)→ normal position
Dental Analysis	IMPA	Tweed	90 ± 5°	99.69°	94.45°	5,44	Lower incisors proclined→ normal
	J–SN (degrees)	Jarabak	102 ± 2°	60.06°	113.82°	-73,75	Upper incisor upright→ protruded
	J–NA (degrees)	Steiner	22 ± 4°	30.17°	26.74°	3,43	Maxillary teeth proclined
	2–NA (mm)	Steiner	4 ± 2 mm	4.46 mm	4.76 mm	-0,3	Normal
	1–NB (degrees)	Steiner	25 ± 4°	34.00°	30.36°	3,64	Mandibular teeth proclined
	1–NB (mm)	Steiner	4 ± 2 mm	5.38 mm	4.05 mm	1,3	Normal
	1/1 – Interincisal angle	Ricketts	130 ± 8°	114.48°	120.94°	-6,45	Incisors protruded
	1–APo (mm)	Ricketts	1 ± 1 mm	4.63 mm	2.94 mm	1,69	Lower incisor Protruded
	Upper lip - S Line	Steiner	0 ± 2 mm	-2.45 mm	-4.20 mm	-1,75	Upper lip normal
	Lower lip - S Line	Steiner	-1 ± 2 mm	0.49 mm	-4.10 mm	-4,59	Lower lip protruded→ normal

Cephalometric changes between the initial and the final Cephalogram (Osteo T3*, Micto.ux Software)

DISCUSSION

▪ A controversy still exists regarding the efficacy and long-term stability of functional appliances when treating malocclusions. In the literature, most of the studies, have a small sample size, bias and confounding factors, among other methodological errors. Thus, the quality of the studies was not sufficient enough to draw any evidence-based conclusions[6, 12-14].

▪ Future studies evaluating the efficacy of functional appliances should consider the differences in appliances and do not generalize to all of them the results from one type of appliance.

▪ The case presented have shown that the SN3 is an effective alternative for treating anterior open bite. Similar results have been reported with Simões Network appliances[15-20].

▪ In open bite patients, the tongue at rest tends to be positioned between the upper and lower incisors and thrusting forward on. This patient had tongue thrust which was not present at the end of the active treatment with the functional appliance. That positive outcome could have resulted from a change in the posture of the tongue at rest and swallowing stimulated by the functional appliance[14].

CONCLUSIONS

▪ It was observed that the SN3 appliance was an effective and efficient method to treat open bite malocclusion, producing a favorable mandibular rotation possibly due to a better position of the tongue.

▪ General and pediatric dentists, as well as orthodontists, may find this technique useful in managing open bite cases of the mixed dentition.

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