

Myofunctional Therapy

Part 4: Prevention and treatment of dentofacial and oronasal disorders

S. Saccomanno¹, G. Berretin-Felix²,
L. Coceani Paskay³, R. J. Manenti¹, V. Quinzi¹

¹Department of Health, Life and Environmental Science, University of L'Aquila, L'Aquila, Italy

²University of São Paulo, Brazil, Department of Phonoaudiology, Faculty of Odontology in Bauru (USP-FOB), Bauru, Brasil

³Academy of Orofacial Myofunctional Therapy (AOMT), Pacific Palisades, USA

E-mail: sabinasaccommanno@hotmail.it

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Abstract

The orofacial functions of breathing, swallowing, mastication and speech allow for harmonious craniofacial growth and development. Correct development must be promoted from birth, and myofunctional therapy is an excellent tool for the prevention and treatment of craniofacial and oronasal disorders.

KEYWORDS Prevention, Dentofacial oronasal disorders, Myofunctional therapy, Myofunctional, Protocols.

Introduction

In order to chew, swallow and speak, different structures of the stomatognathic system are involved, supported by the central nervous system. The coordination between oral functions and breathing is essential to provide efficiency and safety during feeding, as well as effectiveness during speech. Also, nasal breathing is paramount to stimulate balanced dentofacial development, to maintain adequate muscle tone of intra- and extra-oral soft tissues, and to allow a fundamental treatment of the breathing that supplies body vital functions.

Many factors may interfere with dentofacial development, such as oral breathing, ankyloglossia, prolonged nutritive and/or non-nutritive sucking habits, with a greater influence of the genetic characteristics. Thus, early detection and treatment of these conditions are fundamental to prevent morphological and myofunctional disorders [Paglia, 2021].

Prevention

Prevention of orofacial myofunctional disorders (OMDs) begins at birth with an accurate evaluation to detect a restricted lingual frenum and assess latching abilities and optimal breastfeeding. It is successful and prolonged breastfeeding that promotes the tone and coordination of all the orofacial muscles for more "adult" functions, such as chewing and food

manipulation. Then it is important to properly wean a child to allow the integration of the orosensory and motor systems, as even a young child is able to manipulate "adult food" and learn how to chew and swallow safely [Rapley, 2015], considering that for most of human existence "baby food" was unknown [Boyd et al., 2021a, 2021b]. However, it is never too late to prevent further OMDs even when the child is at an age where orthodontic therapy may be needed. Prevention of OMDs is a life-long endeavour.

Assessment

Specific tools are necessary to reach a diagnosis of myofunctional disorders. There are general protocols, such as the validated Protocol of Orofacial Myofunctional Evaluation with Scores (OMES) (De Felicio et al., 2008), which has been expanded [De Felicio et al., 2010], adapted for adults [De Felicio et al., 2012], for the elderly [De Felicio et al., 2017], as well as for patients with obstructive sleep apnoea [Folha et al., 2015; Gelb et al., 2021]. Another comprehensive myofunctional protocol, is the MBGR Protocol [Marchesan et al., 2012], which was developed in the Portuguese language and trans-culturally adapted into English. It was validated to assess patients with temporomandibular disorders [Bueno et al., 2020], and later was expanded to assess individuals with a cleft lip and palate [Graziani et al., 2019]. Also, there are specific protocols which can be applied to a lingual frenulum examination, validated for infants [Martinelli et al., 2016] and developed for patients starting from 6 years of age and older [Marchesan, 2012] (Table 1, 2).

The data provided by the myofunctional clinical examination allow the clinician to better understand the presence of morphological and functional changes, and the relationship between them, i.e., cause and effect.

Subjects presenting dentofacial anomalies show more disturbances concerning breathing [Paglia, 2019], chewing, swallowing, speech, dental occlusion, compared to those with balanced dentofacial morphology, and the damage to these oronasal functions impairs the quality of life of these subjects [Saccomanno et al., 2012; Migliorucci et al., 2015] (Fig. 1–6). In addition, the oral and laryngeal motor control is also impaired in patients presenting dentofacial deformities [Steven, 2012]. Hence, the prevention of dentofacial structural malformations is very important, in order to avoid myofunctional disorders [Boyd et al., 2021a, 2021b].

Structures	Diagnostics	Therapy
Nose	ENT evaluation, Glatzel mirror, Rosenthal test, Gudini test, Cottle sign	Nasal hygiene, breathing repatterning, surgery, OMT
Lips	IOPI, OMES, MBGR	Breathing repatterning, OMT, lip bumper
Cheeks	OMES, MBGR, IOPI	OMT, kinesio-taping
Mandible/TMJ	CBCT, MRI	Orthodontic treatments, surgery, bites/splints, OMT
Dentition	Classifications: Angle's, McNamara's, Bjork's, Petrovic's etc.	Orthodontic treatment, OMT, surgery,
Tongue	IOPI, OMES, MBGR	OMT
Soft Palate	Visual inspection, cranial nerve testing	Surgery, OMT
Hard Palate	Width standard measurements, McNamara's and Pont's Index	RPE, DOME, MARPE, removable orthodontic devices, corticotomy, maxillary surgery
Facial Muscles	SEMG, OMES, MBGR	OMT, kinesio-taping
Chewing Muscles	SEMG, OMES, MBGR, colorimetric beads	TENS, OMT
Frenula	Martinelli, Marchesan protocol, ATLF (Hazelbaker), Kotlow etc.	Frenotomy, frenectomy, OMT
Saliva	Test for salivary output, tongue depressor test	Dietary options, OMT, chewing, medications, saliva substitutes
Tonsils/Adenoids	Tonsils/adenoid Brodsky scale, allergy tests	Surgery (TA), RPE, dietary modifications, breathing re-education
Others	<ul style="list-style-type: none"> — Check for Eustachian tube/middle ear dysfunction. — Check for visual/eyesight problems related to head posture. — Check for postural issues affecting head/neck/shoulders. — Perform at least a cursory cranial nerves functionality test. — Perform a sensory qualitative and quantitative test — Perform a qualitative sensory test (QST) 	Multidisciplinary approach.

TABLE 1 List of common, but not exhaustive, options of diagnostic and therapy tools/protocols for orofacial structures.



Functions	Diagnostics	Therapy
Chewing	Colorimetric tests (gum, capsules), SEMG, OMES, MBGR	OMT, orthodontic therapy, oral health, food textures
Swallowing	Barium fluoroscopy, bedside assessment, fMRI, OMES, MBGR	OMT, swallowing therapy (by specialized SLPs)
Sucking	Breathing assessment, sucking/swallowing timing norms, reflex integration	Frenotomy, frenectomy, lactation consultation, multidisciplinary approach, OMT
Breathing	Spirometric and rhinometric tests, Glatzel's mirror, Cottle's sign, Rosenthal's test, PAFORE protocol	RPE, breathing retraining, nasal hygiene, OMT
Sleep	PSG, Mallampati, Friedman, STOP-BANG and BEARS questionnaires, BMI, ESS	MAD, CPAP, OMT, sleep hygiene, behavioral treatment

TABLE 2 List of common, but not exhaustive, options of diagnostic and therapy tools/protocols for orofacial and nasal functions.

When a myofunctional alteration derives from a morphological condition and functional adaptations are established, then the correction of the form comes first in the treatment plan. For example, a nasal obstruction must be solved first, thus allowing the use of the nostrils during the inspiration and the exhalation process, as well as the breathing coordination between nasal and oral functions. On the other hand, there must be a harmonic dentomaxillary relationship achieved with a dental/orthodontic treatment for the speech therapist to guide the reorganisation of tongue function, during chewing, swallowing and speech. Moreover, myofunctional therapy is necessary to provide stability for any dental treatment, as it reorganises oronasal functions according to the new morphological condition [Botzer et al., 2021].

Myofunctional therapy

During myofunctional therapy, strength, mobility and muscle coordination are improved, in order to provide an adequate performance during oral functions. The chewing muscles must have enough tone for the mandible to be stabilised during swallowing, mobility for it to perform masticatory movements and for adequate strength to provide efficient chewing. The tongue must show free movements, as well as an adequate contraction of the intrinsic muscles, in order to move the food bolus onto the dental occlusal surfaces, to organise and move the food bolus during the oral phase of swallowing. The tongue must be able to form



FIG 1, 2 Examples of malocclusion as a result of a structural issue due to orofacial and nasal dysfunctions.



FIG. 3, 4 Examples of dark circles under the eyes (venous pooling) in children with chronic oral breathing.

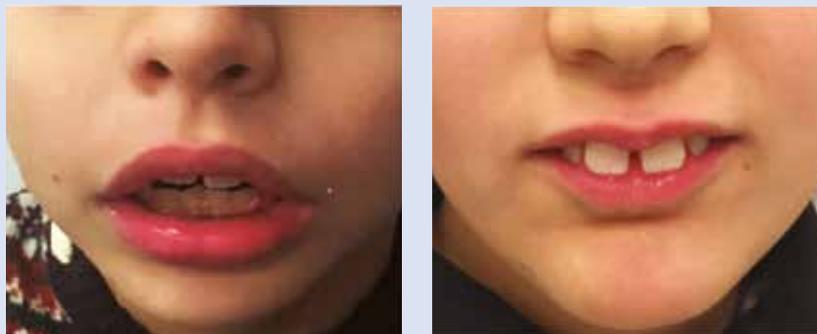


FIG. 5, 6 Examples of habitual oral posture, suggesting nasal and orofacial dysfunctions.

a contact with different areas of the mouth (called placement) during speech articulation. Finally, facial muscles, including the buccinator and the orbicularis oris [lips] muscles, play an important role during feeding, by maintaining the food or liquids inside the mouth, during speech, since the lips are involved in the production of specific speech sounds, and in oral hygiene, by helping remove food particles from the vestibules.

Acquiring an adequate oronasal functional pattern is complex, since breathing, chewing, swallowing and speech are behaviors determined by neurological central pattern generators [Steven, 2012; Barlow and Estep, 2006]. Not only is muscle strength and neuromuscular coordination necessary to change oronasal functions, but there is also a need for a structured training programme to reach an adequate functional performance. Learning new motor patterns involves the recruitment of neural and peripheral structures of the head and neck, modulated by environmental and sensory stimuli. In order to facilitate patients' comprehension regarding their neuromuscular recruitment process, biofeedback can be considered an important tool, as the literature shows its effectiveness in improving exercise techniques in patients with musculoskeletal impairment [Giggins et al., 2013]. Beyond the myofunctional aspects, when present, speech disorders must be investigated, because they involve audiological, linguistic and, mainly, phonological (patterns of speech sound errors) issues. This field is very challenging and demands integrated therapy among speech therapists, physicians, dentists, orthodontists, dental hygienists, psychologists, nutritionists, and physical therapists.

Conclusion

Myofunctional therapy needs to be considered along the continuum of care from birth onward as OMDs can be prevented or reduced in severity at any point. The number and quality of ad hoc assessment and therapy tools to do so is increasing, although further research is still needed to establish the validity of specific protocols.

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