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A new treatment proposal for patients with mouth breathing syndrome

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Abstract

Mouth breathing is a serious problem in daily orthodontic practice. It develops orofacial characteristics that can be prevented by functional rehabilitation and through programmed stimulation therapy. This article will show a working protocol based on the normalization of the oral functions and preventing relapse in orthodontics.

Keywords: Mouth breather. Nasal stimulator. Buccal obturator. Multifunction System "MFS".

Introduction

Normal respiration involves the proper use of the nasal tract and nasopharynx. It is helpful to understand that, although humans breathe primarily through the nose, under certain physiological circumstances, we all partially breathe through the mouth. The most important of these circumstances is when an increased amount of air is needed during exercise. Once this physiogical phase of mouth breathing is overcome, the problem of limiting nasal breathing begins as a result of problems with position, growth, speech, development, morphology and malocclusions, among others[1].

Physiology of breathing

According to the dictionary of scientific terminology, breathing is defined as the function through which gases that are needed to sustain life are absorbed from the outside environment and harmful gases are eliminated. This is done on an involuntary, constant basis and is one of the body's most important functions. A healthy human at rest breaths 12 to 15 times per minute and each of these breaths inhales and exhales 500 ml of air. At maximum effort, the body can inhale approximately 3,500 ml of air[2,3].

The mouth breathing patient

The mouth breathing patients have orofacial characteristics that define their symptomatology (Figure 1):

- Subpalpebral dark circles (due to fatigue caused by light agitated sleep with micro-awakenings).
- Micro-rhinodysplasia (resulting from hypoplastic development in the middle third of the face).
- Postural labial incompetence (resulting directly from respiration).
- Chin retrusion (due to posterior rotation of the mandible).
- Class II division 1 malocclusion.
- Secondary habits (usually accompanied by atypical swallowing)[4].

Nasal collapse

In 1986, Wilmert stated that the etiological factors for nasal respiratory obstruction in orthodontic consultation were primarily hypertrophy of the tonsils and adenoids in 39% of patients, followed by allergic rhinitis in 34% of patients, deviated nasal septum in 19% of patients, turbinate hypertrophy in 12% of patients, vasomotor rhinitis in 8% and a small percentage due to other causes such as polyps and tumours[5]. It should be noted that at no point did he mention nasal collapse, revealing that this pathology was unknown in that era.

One of the most common causes of what was believed to be the multifactorial origin of nasal obstruction is nasal valve collapse[6]. Collapse of the nares leads to resistance failure due to negative inspiratory pressure. The cause of this problem is weakness in the anatomical structures of the nasal wing. It is helpful to remember Poiseuille's law, which states that the passage of air through the nose is proportional to the radius of the nasal duct. Flow increases to the fourth power. For this reason, small changes of up to 1 mm in the size of the nostril will have effects on the resistance of airflow in the nasal cavity. Normal nares have sufficient rigidity to prevent collapse during calm inspiration. However, they can collapse instead of dilating during maximum effort[7]. For this reason, many athletes use external devices to counteract this effect for better performance.

Nasal collapse dysfunction can be caused by a physiological or structural disorder. When evaluating nasal collapse dysfunction, the patient is asked to take a deep breath in order to allow the examiner to distinguish between nares that dilate, those that are static or those that collapse. This is quantified using nostril codification based on the "MFS" Multifunction System.

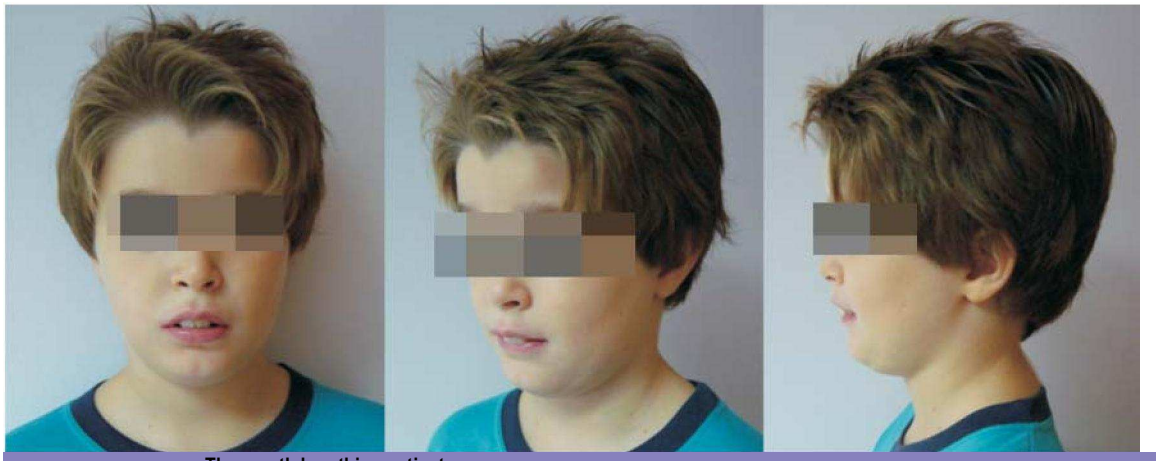

Figure 1 **The mouth breathing patients**

(Figure 2)[8]. Static nares represent partial obstruction, which is why the patient must use greater negative inspiratory pressure to overcome the respiratory insufficiency. In cases of dysfunction, due to an insufficient support structure, or in cases of very weak anatomical structures, when the collapse occurs the patient tries to inhale with greater force, a counterproductive manoeuvre that aggravates the problem[9].

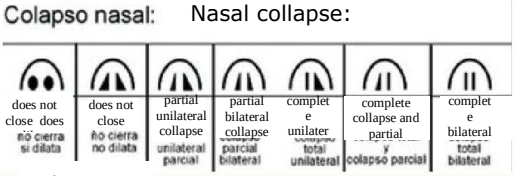

Figure 2

Coding for Nasal collapse according to "MFS"

Figure 3

"MFS" Nasal stimulators

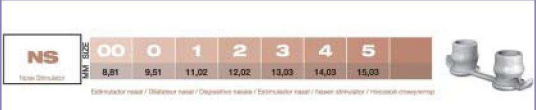

Figure 4

Different commercially-available sizes of "MFS" nasal stimulators

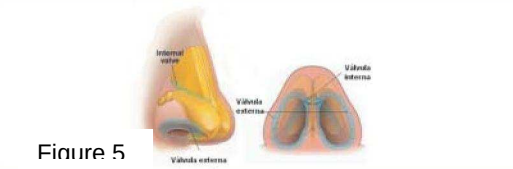

Figure 5

Acción interna de los MFS" Nasal Stimulators"

The only way, currently, to resolve this problem is by using various surgical techniques, the majority of which are focused on the traditional concept of the nasal valve. These techniques act on the valve itself or the triangular cartilage and their results are not very encouraging. Other techniques use polyethylene implants to maintain rigidity of the nasal wing. A new surgical technique has recently been described, known as the lateral crural "J" flap repair. This technique, which is simple and can be performed under local anaesthesia, improves both the nasal obstruction and the defects associated with nasal collapse[10-12].

New therapeutic options are currently being developed for this pathology; these include electromyography and biofeedback of the nose[13-14]. This treatment involves disadvantages, such as: high cost, home exercises that take between 5 and 10 minutes for the patient, and numerous visits to a specialist (3 times per week for 6 weeks and then once per week for an additional 6 weeks). With a new alternative for correcting this dysfunction in mind, the "MFS" Multifunction System has created a new type of device and protocols for re-educating and restoring nasal respiration[15].

"MFS" Nasal Stimulators

We use "MFS" nasal stimulators (Figure 3) as a device to promote and restore nasal breathing. These consist of two tubes, joined by a stabilizer band, with a flat zone that is in contact with the nasal septum, an external convex surface that squeezes the nasal wings, a tab that stimulates muscle insertions in the nasal wing and an external stopper that avoids inadvertent impact of the tubes in the nose. There are seven sizes, two for children (00 and 01) and five for adolescents and adults (1, 2, 3, 4 and 5) (Figure 4). We can therefore confirm that they can be used in patients of any age[16].

"MFS" nasal stimulators stimulate the insertions of the perinasal muscles in the nose. They open the air passages in the nares and remodel the nasal cartilages, harmonizing the shape of the nasal pyramid. In addition, they have a dual action on the internal and external valves of the nose (Figure 5). It is important to add,

there is increase in oxygen level in the body since the patient is easily capable of filling their lungs with air. This produces significant changes in the appearance of paediatric and adult patients[17]. Nasal stimulators will act on the elevator muscles of the upper lip and the zygomaticus minor muscle, leading to a dilator effect on the nares. In addition, they stimulate and lead to development of the elevator muscles of the upper lip and nasal wing, together with the nasal muscle, thereby achieving elevation of the nasal wing. Therefore, we can see that this is a corrective therapy process achieved through stimuli and exercises based on correction through functional re-education (Figure 6).

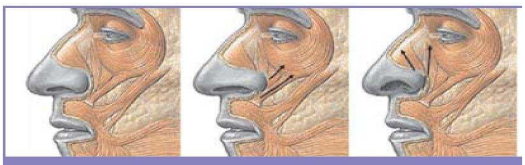

Figure 6 **Effects on the muscles when using "MFS" Nasal Stimulators"**

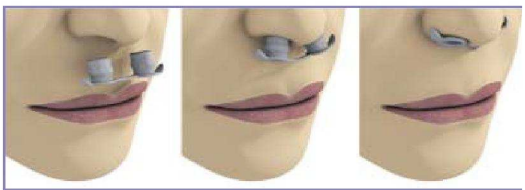

Figure 7 **Positioning of the"MFS" Nasal Stimulators"**

Form of use

When the "MFS" stimulators are applied, the first step is choosing the proper size. This is done by using an orthodontic "nonius" to measure the diameter of the dilated nasal openings and selecting the same diameter of the openings. When there is doubt, we recommend using a size smaller. In order to facilitate introducing the device in the nares, use of Vaseline or a water-based lubricant is recommended. The indication is for nocturnal use, meaning the patient should place the devices for use while sleeping. After a few months, the patient is issued a larger size successively until maximum dilation of the nares is achieved (Figure 7).

"MFS" Buccal Obturator

Buccal obturators are used to block the mouth and progressively impede mouth breathing caused by various malocclusions and recidivism following orthodontic treatment. Buccal obturators are nothing more than sheets designed to adapt to the arcades that progressively impede the flow of air through the mouth in mouth breathers. The superior and inferior rims or peripheral ridges induce the patient to exercise the lips, a very important factor in normalizing nasal breathing[18]. There are three types of obturators, according to the perforations they contain, which come in 6 different sizes. The first three are for paediatric use and the larger sizes are for adults (Figure 8).

– Permeable buccal obturators with large orifices that allow for air to pass though in a limited fashion (Figure 9).

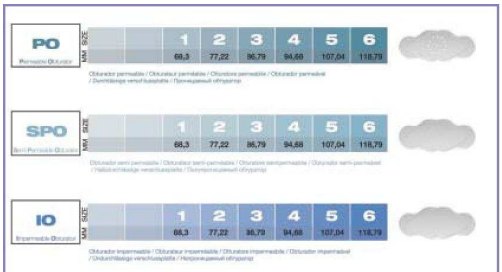

Figure 8 **Different sizes and distinct types of "MFS" buccal obturators**

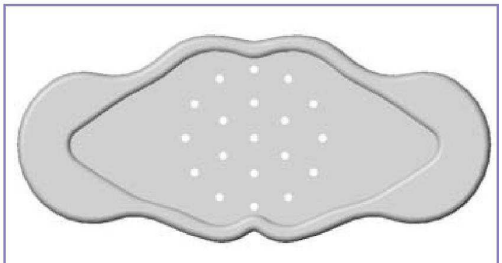

Figure 9 **"MFS" permeable obturator**

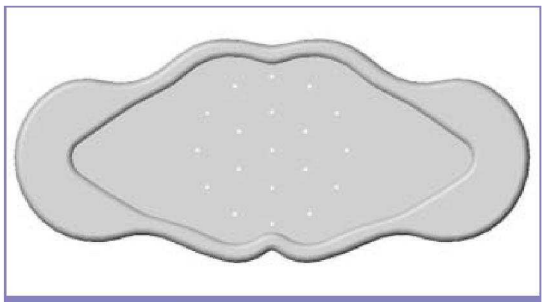

Figure 10 "MFS" semipermeable buccal obturator

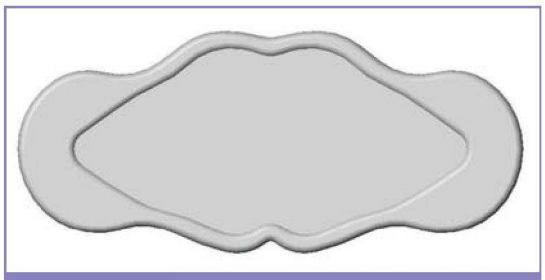

Figure 11 "MFS" impermeable obturator

Figure 12 Colocación del MFS" Buccal Obturator"

– Semipermeable buccal obturators with smaller holes that control and greatly limit the passage of air through the mouth (Figure 10).

– Impermeable buccal obturators, without holes, that completely limit the passage of air through the mouth (Figure 11).

Form of use

Buccal obturators are always prescribed in combination with nasal stimulators in order to avoid a "shocking" effect in the patient. They should also be used after the physical causes of mouth breathing have been eliminated: Rhinitis, deviated nasal septum, hypertrophic adenoids or tonsils are the most frequent causes. When placing the obturator on the patient, the perimeter between the first permanent molars should be measured in the patient's mouth or on the patient models. This measurement will determine the proper size to be selected. The permeable obturator will be placed first in order to initiate normalization of the breathing pattern.

The obturator is placed in the vestibule of the patient's mouth between the teeth and the lips and cheeks (Figure 12). The patient is instructed to keep the device in the mouth at night and, if they struggle to adjust to the device in the beginning, to use it at home during the day in order to become accustomed. If the patient has adapted well to using the permeable obturator, after three or four months, they are instructed to use a semipermeable obturator and at the end of three or four additional months, the impermeable obturator is used. Improvement can also be evaluated clinically, at the level of the lips (labial competence), by exercising the Perioral muscles. It is important to point out that this device can be used in conjunction with fixed orthodontic appliances.

Results

The immediate result is the increase in the volume of air that passes through the nose with the resulting improvement in nasal respiration, snoring and apnea, as has been described by other authors[19]. Over time, we can notice an improvement from the complete bilateral collapse of the nares to dilation, within 7 to 9 months (Figures 13 and 14), thanks to improved activity of the paranasal muscles that have been stimulated by the device. After 9 months of active treatment each night, the effects of the nasal stimulators may relapse if their use is discontinued, so patients who snore should be encouraged to continue using the device, especially those patients who also suffer from apnea. Mouth breathers will continue to use the device until their problem has resolved completely. It is important to add that this device may be used together with fixed or removable orthodontic appliances as proposed by programmed stimulation therapy[20].

Figure 13 **Patient with the nares in a resting state, complete bilateral collapse on maximum inhalation, nasal dilation on maximum inhalation. 6 months after treatment**

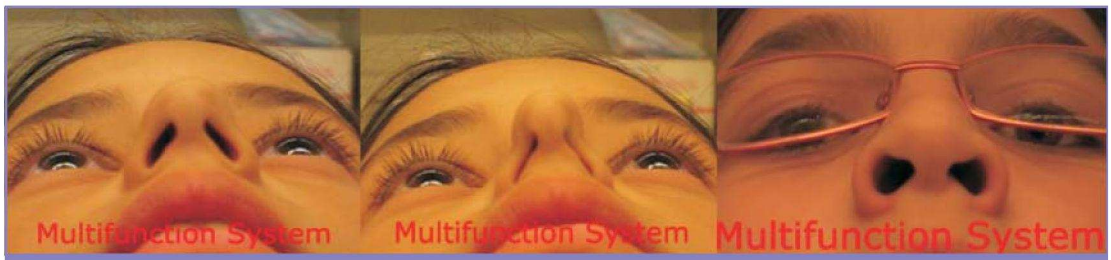

Figure 14 **Patient with the nares in a resting state, complete bilateral collapse on maximum inhalation, nasal dilation on maximum inhalation. 9 months after treatment**

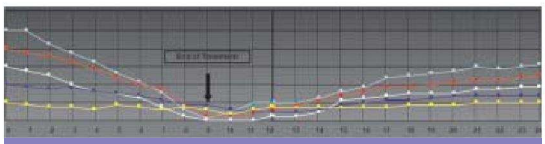

Figure 15 **Long term progression from the use of "MFS" Nasal Stimulators where the use was discontinued at 9 months of treatmentand the level of recurrence was**

Nasal dilation improves nasal respiration[21] by eliminating nasal collapse through dilation of the nares. This leads to improvement in the patient's snoring at night as well as mouth dryness. The codification for nasal collapse, as well as its proper treatment, therefore consists of two elements to keep in mind when considering snoring. This is also effective in the case of patients, who suffer from snoring, with chronic rhinitis. It improves snoring in patients who have rhinitis but who lack other factors, such as obesity. Despite the improvement seen in snoring, the same does not apply to sleep apnea. Studies do not demonstrate improvement in sleep apnea, even though many patients note subjective improvement in symptoms, including night-time rest. In a study on the effects of nasal stimulators on snoring patients, efficacy was seen in 81.8% as stated by the partners of study subjects. There were no statistically significant differences between men and women. It was concluded that nasal stimulators are an additional element for improving snoring thanks to the nasal dilation effect described above[22].

A study was carried out to evaluate the efficacy and possible recurrence from nasal stimulators. 80 subjects with different types of nasal collapse were included, all of whom had severe type 3, 4 and 5 collapse. The subjects achieved complete normality and nasal dilation

within a maximum period of 8 to 9 months of daily night-time treatment. The use of the devices was then discontinued in order to evaluate, quantify and measure the level of recurrence that could be expected from this treatment. After 3 months without using the nasal stimulators, the collapse returned to a lesser degree and increased gradually over the next months. 15 months after discontinuing the use of nasal stimulators, we can confirm that the recurrence seen in the study simple once again collapsed but there was a 50% level of improvement. In other words, a type 5 collapse, after 9 months of treatment, became a type 0, meaning proper dilation. However, after 15 months without use, the patient had a type 3, meaning partial collapse of both nares (Figure 15).

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