The MFS buccal obturator as a clinical method for treating lip incompetence in mouth breathers

José Durán[1]
Alberto Carrasco[2]
Pablo Echarri[2]
Josep M. Ustrell[3]
Miguel Merino Arends[4]

[1]Chair of Department of Orthodontics at Universidad de Barcelona
[2]Orthodontist
[3]Profesor at Universidad de Barcelona
[4]Dentistry Graduate from Universidad Central de Venezuela
Orthodontics Master's Student at Universidad Autónoma de Barcelona

Correspondence:
José Duran von Arx Maó, 19 bajos
08022 Barcelona

Abstract

Mouth breathing develops certain orofacial features that can be prevented by using functional breathing re-education. The MFS buccal obturator was used in a sample of 48 patients, demonstrating that the degree of lip incompetence in these patients was reduced.

Key words: MFS buccal obturator. Lip incompetence. Mouth breathing.

Introduction

The mouth breather[1-6]

These are patients who inhale through the mouth as they find it difficult to breathe through the nose. There are many causes of mouth breathing and these are often due to nasopharyngeal or oropharyngeal airway resistance in the patient, resulting in total or partial obstruction of the upper airways.

Mouth breathers have orofacial features that depict their symptoms:

– Periorbital dark circles, or bags under the eyes (due to exhaustion as a result of restless sleep with arousals).
– Microrhino dysplasia (as a result of hypoplasia of the middle third of the face).
– Postural lip incompetence (as a direct result of breathing habit).
– Chin retrusion (due to posterior rotation of the mandible).
- Class II/1 malocclusion.
– Secondary habits (atypical swallowing tends to accompany mouth breathing).

Of all these symptoms, the problem that can be corrected most quickly and without the need for orthodontic treatment is lip incompetence, which will be the objective of this article. The effects that clinical use of the MFS buccal obturator has on lip incompetence will indicate the degree of improvement in the mouth-breathing habit and will be an objective and reliable parameter.

Re-education of the mouth-breathing habit

Re-education of breathing is not easy, especially in view of the wide variety of factors involved. The first step towards reaching a diagnosis is to determine the MFS functional code of the nostrils and the degree of hypertrophy of the adenoids and tonsils[7,8]. Knowing how these three codes condition the breathing habit is important. Once the functional code has been determined, we can then determine the severity of each factor:

– Nasal collapse code: determines the degree of inspiratory function of the nasal pyramid and nostrils. Severe nostril collapse (code three, four or five) requires immediate use of the MFS nasal stimulator tubes to dilate the nostrils and stimulate the perinasal muscles.
– Adenoid hypertrophy code: assessed using X-rays, this code tells us the degree of airway obstruction in the nasal cavity. High values for this code (four and five) would force us to consider an adenoidectomy.
– Enlarged tonsil code: this can be viewed directly on the patient and gives us an objective assessment of the oropharyngeal airway. High values for this code (four and five) would require a tonsillectomy.

Once the most common factors of mouth breathing have been determined, the resulting habit must then be assessed as quickly as possible[9-11].

MFS buccal obturator

In order to control and correct the mouth-breathing habit, an MFS buccal obturator has been designed with a "figure eight" appearance, with thicker edges and a middle plate section that may or may not be perforated. It is made from a highly elastic material that can be moulded onto tooth surfaces and is available in different sizes or measurements (Figure 1). There are three types of MFS buccal obturators:

- Permeable (Figure 2): with larger holes in the centre of the middle elastic plate section.
- Semi-permeable (Figure 3): with small holes in the centre of the device.
- Impermeable (Figure 4): with no holes in the central area.

The buccal obturator must be used by the patient during the night, placing it in the oral vestibule, between the teeth and the lips/cheeks. This prefabricated device is very easy to fit into the mouth and causes no discomfort other than the sensation caused by impeding airflow through the mouth. Patients, however, easily adapt to this new functional situation.

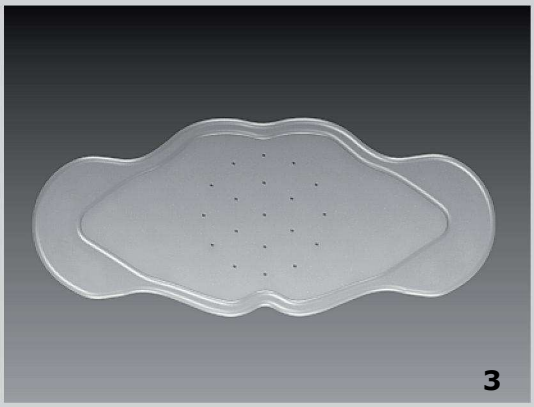
The effects of the MFS buccal obturator are related to the design of the device as follows:

- Limitation (to a greater or lesser degree) or suppression of airflow through the mouth when inhaling. This depends on whether the obturators have holes or not and their size.
- Stimulation of the orbicular muscle of the lips caused by the thick rims of the device. Lip muscle exercises also cause the lip morphology and posture to change.

Working hypothesis

We have no doubts regarding the obturator effect of this device and, therefore, we accept this function according to the progressive effect of the three models of buccal obturators: permeable, semi-permeable and impermeable.

However, the obturator action is also accompanied by certain clinical changes that are evident when the devices are placed into the mouth. The lips immediately project over the peripheral edges of the buccal obturator and slide across the obturator surface. These clinical changes, observed from the first time the devices are used, and even more so after prolonged use, result in improved lip incompetence in these patients.



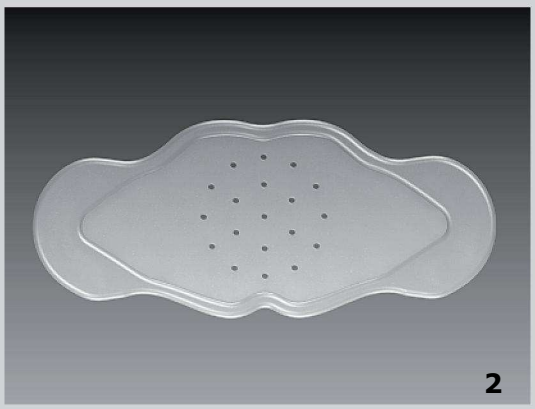


Figure 1. Different sizes of obturators

Figure 2. Permeable buccal obturator

Figure 3. Semi-permeable buccal obturator

Figure 4. Impermeable buccal obturator

The effect of progressive suppression of the mouth-breathing habit is therefore accompanied by certain changes in lip morphology and lip competence.

Objectives of this study

The sole objective of this study is the following:

– To determine the effects of the use of the MFS buccal obturator on the degree of lip incompetence.

Materials and methods

A sample of sixty patients was selected with the following characteristics:

– Aged between six and nine years.

– Mouth breathers.

– No severe malocclusion:

- Class I molar and canine malocclusion.
- No marked overhanging of incisors as this could cause lip incompetence to persist.
- No bone-tooth disproportion greater than three millimetres.

– No agenesis of teeth or supernumerary teeth.

– No ear, nose or throat problems that could be causing mouth breathing.

The degree of lip incompetence (in millimetres) initially suffered by the patient was determined using 1:1 scale photographs. The photographs were taken with an easily visible millimetre ruler in front of the lips. To do this, the patient was placed in a horizontal position and told to relax, with their eyes closed, for three minutes.

The right size of MFS buccal obturator was selected for each patient and the patient was told how to use it every night.

An appointment was made for the patient every three months to take new photographs using the same parameters used at the start of treatment. This assessment took a total of twelve months.

Therefore, the following photographs were taken of each patient in the study sample:

- Initial photographs.

– Photographs at three months.

– Photographs at six months.

– Photographs at nine months.

– Photographs at twelve months.

Once the photographs had been taken, the degree of lip incompetence was measured on each photograph. To do this, the shortest distance between the lower edge of the top lip and the upper edge of the bottom lip was measured.

The results obtained were then assessed statistically.

Results

Twelve of the sixty patients selected for this study were excluded for the following reasons:

– Two for inability to adapt to the use of buccal obturators.

– Four for not using the "buccal obturators" regularly.

– Four for not attending appointments (for photographs) regularly.

– One as a result of moving to another city. – One as a result of withdrawing from the study programme.

The values obtained for the remaining forty-eight patients who met the basic requirements of this study are as follows:

Descriptive statistics were reported for all variables studied (minimum, maximum, average and standard deviation).

Absolute and relative frequency distribution tables were compiled for the five periods of time: initial, three months, six months, nine months and twelve months. A summary table of all five periods was generated, showing how values decrease as time increases (Table 1-7).

Table 1.
Descriptive statistics

	N	Minimum	Maximum	Average	Std. dev
Initial	48	3.0	6.5	4.667	0.991
3 months	48	0.0	5.0	2.531	1.200
6 months	48	0.0	3.5	1.208	1.020
9 months	48	0.0	2.5	0.500	0.636
12 months	48	0.0	1.5	0.302	0.396

Table 2.
Initial values

	Frequency	Percentage
3.0	2	4.2
3.5	8	16.7
4.0	9	18.8
4.5	9	18.8
5.0	4	8.3
5.5	9	18.8
6.0	3	6.3
6.5	4	8.3
Total	48	100.0

	Frequency	Percentage
0.0	2	4.2
0.5	3	6.3
1.0	3	6.3
1.5	3	6.3
2.0	7	14.6
2.5	7	14.6
3.0	10	20.8
3.5	6	12.5
4.0	4	8.3
4.5	2	4.2
5.0	1	2.1
Total	48	100.0

Table 3. Values at three months

	Frequency	Percentage
0.0	9	18.8
0.5	11	22.9
1.0	7	14.6
1.5	9	18.8
2.0	4	8.3
2.5	2	4.2
3.0	4	8.3
3.5	2	4.2
Total	48	100.0

Table 4. Values at 6 months

	Frequency	Percentage
0.0	22	45.8
0.5	15	31.3
1.0	4	8.3
1.5	4	8.3
2.0	2	4.2
2.5	1	2.1
Total	48	100.0

Table 5. Values at 9 months

	Frequency	Percentage
0.0	27	56.3
0.5	14	29.2
1.0	6	12.5
1.5	1	2.1
Total	48	100.0

Table 6. Values at 12 months

	Frequency Initial	Frequency 3m	Frequency 6m	Frequency 9m	Frequency 12m
0		2	9	22	27
0.5		3	11	15	14
1.0		3	7	4	6
1.5		3	9	4	1
2.0		7	4	2	
2.5		7	2	1	
3.0	2	0	4		
3.5	8	6	2		
4.0	9	4			
4.5	9	2			
5.0	4	1			
5.5	9				
6.0	3				
6.5	4				
Total	48	48	48	48	48

Table 7. Distribution of frequencies in the five time periods

	Sum of squares	df	Square average	F	Sig.
Between groups	625.327	4	156.332	194.22	0.0001
Within groups	189.156	235	0.805		
Total	814.483	239			

Table 8. Comparison of the five averages per period. ANOVA

For hypothesis testing, the significance level used was □ = 0.05.

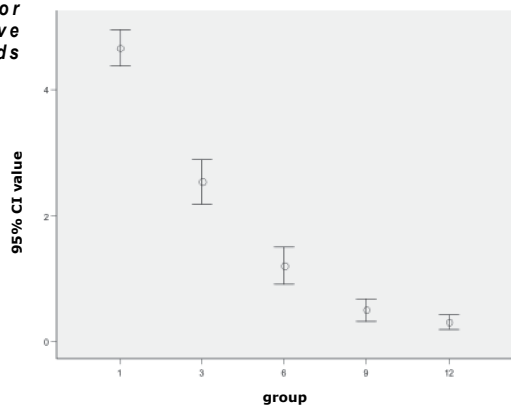
In the joint comparison of the five averages using the Analysis of Variance (ANOVA) statistical test, significant differences were found between the five averages ($p<0.0001$) (Table 8).

A graph of the 95% Confidence Intervals for the averages of the five time periods was plotted, showing a decrease in variable values over time (Figure 5).

The relationship between variable values for two consecutive periods was studied. Although all correlation coefficients are significant, the relationship is more intense as time increases.

When comparing the averages of the two consecutive periods, we see that the Student's t-test values for paired samples decrease as time increases. The most significant difference is between the start and three months and the least significant difference is between nine months and twelve months. The values were also compared between the start and twelve months and the difference was more significant (Table 9).

Figure 5. Graph of the 95% Confidence Intervals for the averages of the five time periods



Individual differences between two consecutive periods were observed. These new variables were described and the 95% Confidence Intervals for the averages of the differences were plotted to assess the average loss between periods. As shown in the table, as time goes on, the differences between periods get smaller. It is suggested that the difference in each period is approximately half the difference of the previous period. Therefore, from the start to 3 months the average difference is 2.13 mm, from 3 to 6 months the difference is 1.32 mm, from 6 to 9 months the average difference is 0.7 mm and finally from 9 to 12 months it is 0.2 mm, much lower than the trend followed by the losses.

It must be noted that practically 50% of the decrease is achieved between the start and 3 months given that the average overall reduction is 4.365 mm and that of the first period is 2.135 mm (Tables 10 and 11).

Discussion

The results obtained show the effect of the "buccal obturator" on lip incompetence in patients. Determination of the data obtained in this study proved to be somewhat difficult when it came to taking the photographs with a relaxed lip posture, the posture that accurately shows the functional state of the lips.

Therefore, study subjects were told to close their eyes and relax. In some cases, several photographs had to be taken before selecting the most representative image of the "relaxed lip posture", although

Table 9. Paired sample correlations

		N	Correlation	Sig.
Pair 1	Initial and 3 months	48	0.335	0.020
Pair 2	3 months and 6 months	48	0.698	0.000
Pair 3	6 months and 9 months	48	0.787	0.000
Pair 4	9 months and 12 months	48	0.803	0.000
Pair 5	Initial and 12 months	48	0.398	0.005

Table 10. Comparison of averages between paired samples

Differences	Average	Standard deviation	t	df	Sig.
Initial - 3 months 3	2.135	1.275	11.60	47	0.0001
months - 6 months	1.323	0.878	10.43	47	0.0001
6 months - 9	0.708	0.651	7.53	47	0.0001
months 9 months -	0.198	0.396	3.46	47	0.0010
12 months Initial -	4.365	0.909	33.25	47	0.0001

Table 11. Descriptive statistics and Confidence Interval for the average difference

	N	Minimum	Maximum	Average	Std. dev.	95% Confidence Interval Lower	Upper
Initial - 3m	48	0.50	5.50	2.135	1.275	1.765	2.506
3m - 6m	48	-1.00	2.50	1.323	0.878	1.068	1.578
6m - 9m	48	-1.00	2.00	0.708	0.651	0.519	0.897
9m - 12m	48	-0.50	1.00	0.198	0.396	0.083	0.313
Initial - 12m	48	3.00	6.50	4.365	0.909	4.100	4.629

We had no reference element that could be used to determine the degree of objectiveness of the photographs.

In some subjects, the obturators initially selected had to be changed for a different size to achieve the best fitting buccal obturator. The same process had to be followed when progressively changing between permeable, semi-permeable and impermeable obturators. Progressive sequencing of obturators was not always possible and patients simply had to adapt to the obturators.

Conclusions

In line with the initial objective, we have reached the following conclusion:

– The MFS buccal obturator reduces the degree of lip incompetence by 4.356 millimetres in twelve months, which is more accentuated in the first three months (2.135 mm).

– For future studies on this matter, we suggest studying new study methods to make the determination of results more objective.

Bibliography

1. Durán J. Multifunction System "MFS". Forma y función: puesta al día de la cuestión. *Ortodoncia clínica* 2003;6(2):79-88.
2. Durán J. Multifunction System "MFS". Las 8 claves de la matriz funcional. *Ortodoncia clínica* 2003;6(1):10-3.
3. Preston B. Las vías respiratorias superiores y la morfología craneal. In: Graber TM, Vanarsdal RL, Vig K. *Ortodoncia: principios y técnicas actuales*. 4th edition. Ed. Mosby. 2006;117-43.
4. Tourne L. Schweiger J. Immediate postural responses to total nasal obstruction. *Am J Orthod Dentofacial Orthop* 1996;110(6):606-11.
5. Gugino CF, Dus I. Unlocking orthodontic malocclusions: an interplay between form and function. *Semin Orthod.* 1998;4(4):246-55.
6. Mc Namara J Jr. Influence of respiratory pattern on craniofacial growth. *Angle Orthod* 1981;51(4):269-300.
7. Durán J. Técnica MFS: Diagnóstico de la matriz funcional: codificación. *Ortodoncia clínica* 2003;6(3):138-40.
8. Padrós E. Cómo cuantificar las funciones y la postura en la consulta de ortodoncia. *Ortodoncia clínica* 2004;7(4):174-204.
9. Durán J. Biomecánica "MFS" en el tratamiento de las mordidas abiertas no esqueléticas. *Ortodoncia clínica* 2004;7(1):36-43.
10. Durán J. Biomecánica "MFS" en el tratamiento de las mordidas abiertas esqueléticas. *Ortodoncia clínica* 2004;7(2):62-73.
11. Durán J. Tratamiento de las maloclusiones de Clase I: apiñamientos moderados, sobremordida y mordida abierta. In: Durán J. *Mecánica fija "MFS". Atlas clínico.* First edition. Barcelona: Ed. Nexus. 2004;53-88.